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WAR MACHINE

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Soviet Naval Infantry

Amphibious Vehicles in Vietnam

US Amphibian Development

Armed Forces of the World: British Army (Part 1)

A fully illustrated guide to Modern Amphibious & Oversnow Vehicles

WAR MACHINE

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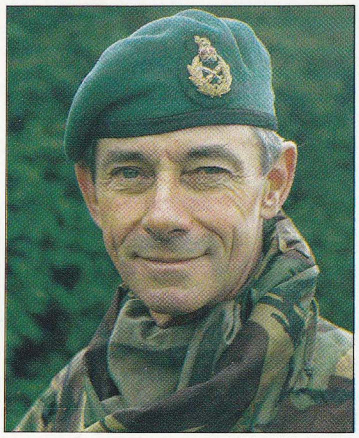

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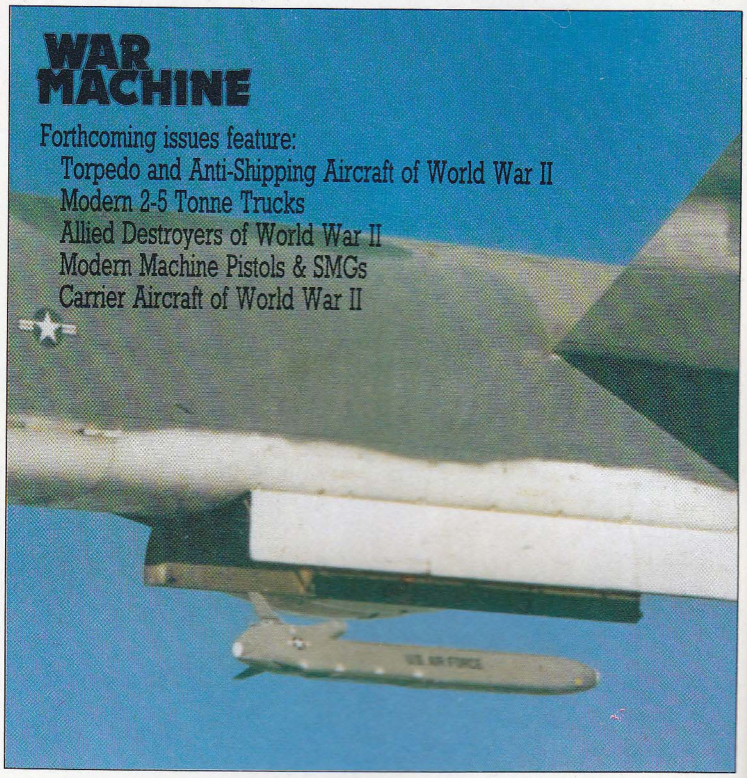

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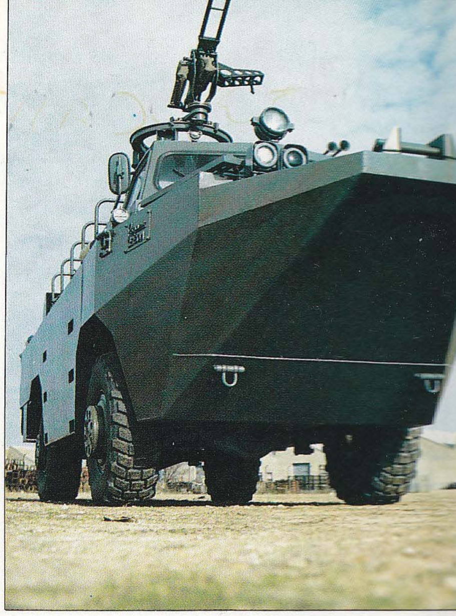
Modern Amphibious and Oversnow Vehicles



Typical of most of the amphibious cargo carriers currently in production, the Pegaso VAP 3550/1 is based on a 4×4 truck to which has been fitted a boat-shaped hull. It is driven by waterjets at up to 5.5 kts while afloat, and can climb a 60 per cent gradient.

For centuries, two of the many problems facing the practitioners of warfare have been water and winter. In this century of total war, it is natural that efforts should have been made to overcome the difficulty.

Amphibious vehicles of one type or another played a significant role with the Allies during World War II, especially in the invasion of Italy, the Normandy campaign, the crossing of the Rhine and the recapture of the Netherlands. Moreover, the countless amphibious operations in the Far East could not have been successfully carried out without the tracked amphibious vehicles commonly known as the Amtracks.

In the post-war period the US Marine Corps kept the art of amphibious warfare alive, and today the USA has the largest amphibious force of any country in the world. The modern US Marine is not only taken ashore in the latest LVTP7A1, but also by landing craft, helicopters and air-cushion vehicles. This gives the commander many more options than in the past as not only can he land troops and equipment on the beaches, but the helicopters also allow him to move men and supplies quickly inland. The 4x4 LARC (Lighter Amphibious Resupply Cargo) carries the cargo from the ships offshore onto the beaches, but in the future its role will be carried out much quicker by the hovercraft.

Many other countries have small marine units, normally under the operational control of the navy, and some of these in the Western sphere have small numbers of the LVTP7 armoured amphibious vehicle.

The Soviet marines have been receiving much new equipment in recent years although, with under 15,000 men, this Naval Infantry force does not yet have the same sustained power-projection role as the US Marine Corps. The Soviets have, however, made far more use of hovercraft in recent years than the Americans, and this vehicle type would prove to be very useful in the Baltic area in times of crisis. The Soviet army maintains many amphibious vehicles for operations in Europe.

Oversnow vehicles are used mainly by the USA in Alaska, the Scandinavian countries (Sweden, Norway and Finland), and of course the Soviet Union. In the West the Swedish company Hägglund and Söner leads in the design, development and production of tracked oversnow vehicles, and its new Bv 206 has already been selected by the USA as its standard vehicle of this type. Other NATO countries, including the UK, maintain specialized units to reinforce Norway in time of war, and these units have Bv 202 tracked oversnow vehicles, to be replaced by Bv 206s in the future.

Primary exponents of amphibious warfare, the US Marine Corps may make an assault in helicopters, air cushion vehicles, landing craft, or in the LVT7 (Landing Vehicle Tracked) series of armoured amphibians. No other nation has any comparable capability.

ITALY

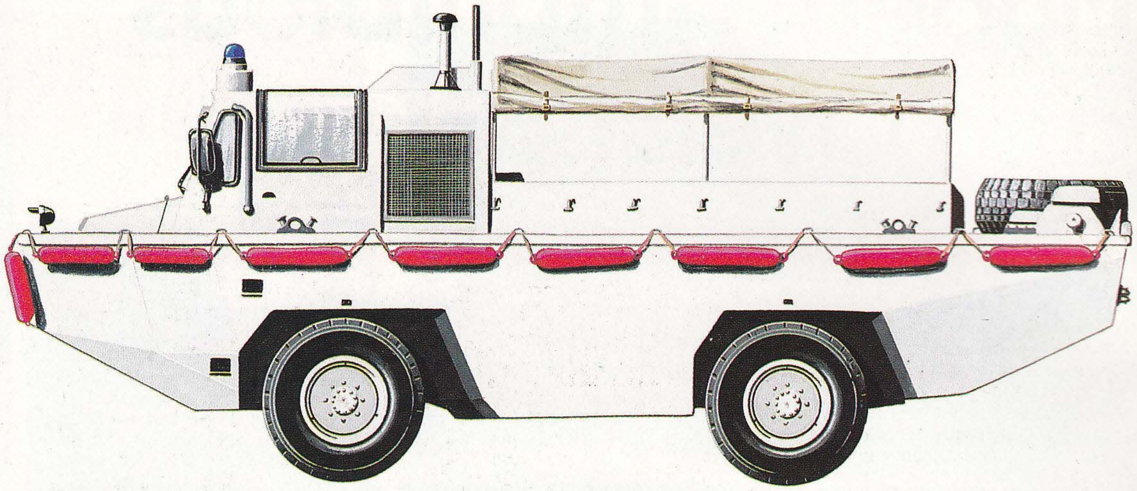
FIAT Type 6640A amphibious vehicle

FIAT is the largest manufacturer of wheeled military vehicles in Italy, and it was natural that when the Italian Home Office Civil Protection and Fire Fighting Department issued a requirement for an amphibious vehicle some years ago that FIAT should tender a vehicle. This entered production under the designation **FIAT Model 6640A**, and can carry a maximum payload on land or water of 2140 kg (4,718 lb).

The hull of the FIAT Model 6640A is of all-welded aluminium construction with a maximum thickness of 4 mm (0.16 in), and is divided into three compartments: engine at the front, crew in the centre and freight at the rear. The engine is coupled to a manual gearbox with five forward and one reverse gear and a torque converter. The suspension, front and rear, consists of an independent strut and link with helical spring and rubber bump stop, with a hydraulic shock absorber. Steering is power-assisted, and on land the vehicle has a turning radius of 7.5 m (24.6 ft).

The crew compartment in the centre is provided with windows and sidescreens, and this and the load compartment to the rear can be covered by bows and a tarpaulin cover. When afloat the vehicle can be powered by its wheels or a four-blade screw type propeller with a Kort nozzle, steering being accomplished by a rudder coupled to the steering wheel. Mounted at the front of the vehicle is a winch with a maximum capacity of 3000 kg (6,614 lb). Three bilge pumps are provided as standard, one in the engine compartment (separated from the crew compartment by a fireproof bulkhead) and another two under the cargo area.

Production of the FIAT Model 6640A has now been completed, but further development has resulted in the **FIAT Type 6640G** which was announced in 1980 and, according to FIAT, is not in production. The main difference between this and the earlier vehicle is the Type 6640G's longer wheelbase and more powerful engine, the latter developing 195 hp (145 kW) and coupled to a fully automatic gearbox with three forward and one reverse gear. The cab is now fully enclosed and provided with a heater, and the vehicle is propelled in the water by a single waterjet under the hull rear.



The aluminium-hulled Type 6640A is in paramilitary service with the Italian home office, used for civil protection and also in the fire service.

The Type 6640A has a cargo capacity of some 3000 kg (6,614 lb) capable of 90 km/h (56 mph) on land; on water it can be manoeuvred by wheels or by a propeller. As with many modern amphibians, the vehicle bears a resemblance to the pioneering American DUKW of World War II.

Specification

FIAT Type 6640A

Crew: 1+1

Combat weight: 6950 kg (15,322 lb)

Powerplant: one FIAT Model 8060.02 6-cylinder diesel developing 117 hp (87 kW)

Dimensions: length 7.30 m (23 ft 11.4 in); width 2.50 m (8 ft 2.4 in); height overall 2.715 m (8 ft 10.9 in)

Performance: maximum road speed 90 km/h (56 mph); maximum water speed with propeller 11 km/h (6.8 mph) or with wheels 5 km/h (3.1 mph); range on land 750 km (466 miles); range on water with propeller 60 km (37 miles) or with wheels 30 km (18 miles); fording amphibious; gradient 50 per cent; trench not applicable; vertical obstacle 0.43 m (1 ft 5 in)

USSR

GAZ-46 MAV amphibious vehicle

During World War II Canada, the UK and the USA shipped vast quantities of military equipment to the Soviet Union, including Ford GPA 4×4 amphibious jeeps and DUKW 6×6 amphibious load-carriers. These were used to ferry men, equipment and supplies across the many rivers in eastern Europe during the push back into Germany. After the end of the war the Soviet Union decided to design two similar vehicles, the **GAZ-46 MAV** being the equivalent of the Ford GPA and the BAV 485 the equivalent of the DUKW. Initial production GAZ-46 vehicles were built on the GAZ-67B 4×4 chassis which was produced during World War II, while later production vehicles were based on the post-war GAZ-69 4×4 500-kg (1,102-lb) light vehicle, which entered production at the Gorki plant in 1952. The main role of the GAZ-46 MAV, apart from its basic role of transporting men and light supplies across rivers and lakes, was in river reconnaissance, but from the late 1950s this role was taken over by the much more capable BRDM-1 4×4 amphibious scout car. In the 1950s the East Germans produced a not dissimilar 4×4 light vehicle for their army under the designation P2M and subsequently developed an amphibious version of this under the designation **P2S**. This was not produced in large numbers and is no longer in service. The P2M was replaced in production by the P3 but the amphibious version of this vehicle did not enter production.

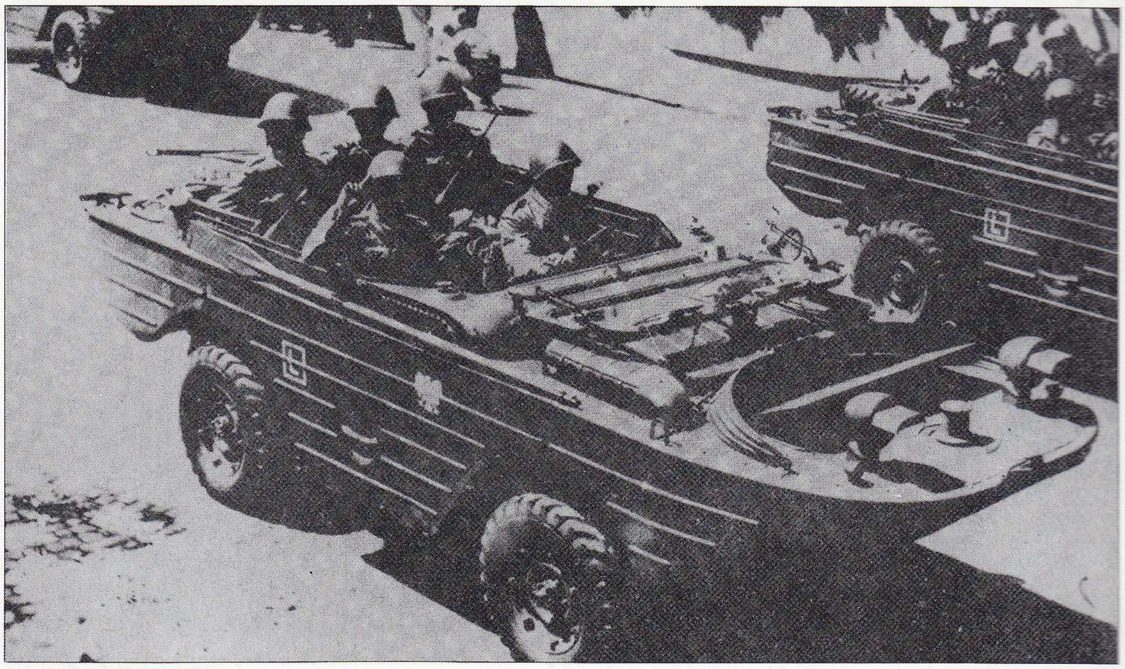
The hull of the GAZ-46 MAV is of all-steel construction with the engine compartment at the very front, the passenger area in the centre, and a spare wheel and tyre carried horizontally on the rear deck. The driver and vehicle commander have individual seats and to their rear is a three-man bench seat. The windscreen can be folded down onto the bonnet, and if required a tarpaulin cover can be erected over the crew area. The engine is coupled to a manual gearbox with three forward and one reverse gear and a two-speed transfer case. The vehicle is powered in the water by a single three-blade propeller mounted under the very rear of the hull and driven from the main engine; before the vehicle enters the water a trim vane is erected at the front to stop water swamping the en-

American aid to the Soviet Union during World War II included large numbers of amphibious trucks, which were of such value that the Red Army copied the concept post-war; the 4×4 GAZ-46 MAV amphibious truck appeared in the late 1940s.

gine and crew compartments. The vehicle has a maximum payload of 500 kg (1,102 lb) and can tow a trailer or light weapon (a mortar or anti-aircraft gun) of similar weight.

Specification

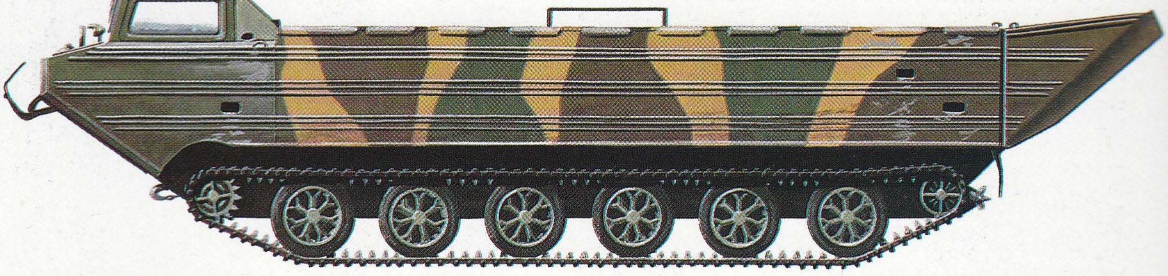
GAZ-46 MAV
Crew: 1+4
Combat weight: 2480 kg (5,467 lb)
Powerplant: one M-20 4-cylinder petrol engine developing 55 hp (41 kW)
Dimensions: length 5.06 m (16 ft 7.2 in); width 1.735 m (5 ft 8.3 in); height with hood up 2.04 m (6 ft 8.3 in)
Performance: maximum road speed 90 km/h (56 mph); maximum water speed 9 km/h (5.6 mph); range 500 km (311 miles); fording amphibious; gradient 60 per cent; trench not applicable



Still in use after more than 30 years, the GAZ-46 amphibian is being replaced in front-line service by BRDM scout cars. With a carrying capacity of 500 kg (1102 lb), it should be regarded as an amphibious field car.

USSR

PTS amphibious vehicle



The PTS has been in Egyptian service for some years, its amphibious carrying capacity having been used to good effect during the Yom Kippur war of 1973.

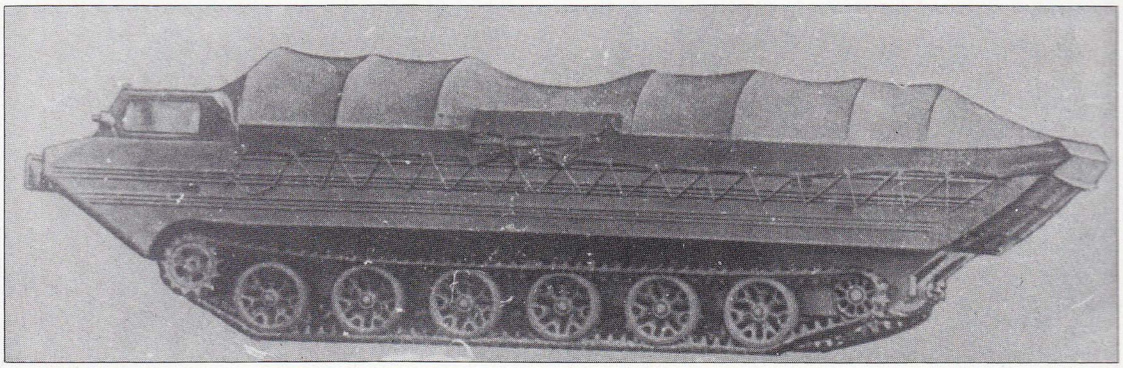
The **PTS** amphibian entered service with the Soviet army in the mid-1960s, and in comparison with the earlier K-61 amphibian has a greatly increased load-carrying capability, slightly higher speed on both land and water, and can also tow a trailer when afloat. The PTS has a steel hull with the crew compartment at the very front of the hull and the cargo area stretching back right to the rear. The crew compartment, unlike those on the earlier K-61 and BAV-485, is fully enclosed, the two-man crew entering via two circular roof hatches. An NBC system is provided to enable the vehicle to operate in an NBC-contaminated area. The engine is beneath the vehicle, with the exhaust pipes on top of the cargo compartment on each side, a configuration which in certain conditions could permit exhaust fumes to be blown back into the cargo area, an unfortunate situation when troops are being carried. The PTS can carry a maximum of 5000 kg (11,023 lb) of cargo on land and 10000 kg (22,046 lb) on water, or up to 70 or so fully equipped troops. Cargo and vehicles such as a Ural-375D 6×6 4000-kg (8,818-lb) truck can be loaded into the PTS via the rear tailgate, which has two integral loading ramps. The suspension of the vehicle is of the torsion-bar type with six dual rubber-tyred road wheels, plus a drive sprocket at the front and an idler at the rear; there are no track-return rollers. The vehicle is driven in the water by two propellers mounted in tunnels under the rear of the hull, and steered by two rudders. Before the vehicle enters the water a trim vane is erected at the front to stop water swamping the forward part of the vehicle, and the bilge pumps are switched on. All vehicles have a front-mounted winch (to recover other vehicles and equipment, or to assist in self-recovery), night driving equipment, a searchlight mounted on top of the crew compartment, radios and an intercom.

The PTS can also tow the specially developed **PKP** boat-shaped two-wheel trailer, which is provided with ramps to enable cargo to be loaded. This has two sponsons, one on each side: for land travel these are folded on top of the trailer, but before entering the water they are swung through 180° and locked in position to provide additional buoyancy. The trailer is used to carry a 122-mm (4.8-in) D-30 howitzer while the PTS vehicle carries the truck, ammunition and crew.

The latest production version is the **PTS-M**, which has minor differences including increased fuel capacity. The only known variant is one used by Poland, which has a rocket-propelled mine-clearing system mounted in the rear. In addition to being used by most members of the Warsaw Pact, the PTS is also operated by Egypt, Iraq and Syria.

Specification

PTS
Crew: 1+1
Combat weight: on land 22700 kg (50,045 lb) and on water 27700 kg (61,068 lb)
Powerplant: one V-54P diesel developing 350 hp (261 kW)
Dimensions: length 11.50 m (37 ft 8.8 in); width 3.30 m (10 ft 10 in); height 2.65 m (8 ft 8.3 in)
Performance: maximum road speed 42 km/h (26 mph); maximum water speed 10.6 km/h (6.5 mph); range 300 km (186 miles); fording amphibious; gradient 60 per cent; vertical obstacle 0.65 m (2 ft 1.6 in); trench 2.5 m (8 ft 2.4 in)



Water-driven by twin tunnel-mounted propellers at the rear, the large PTS is capable of carrying up to 10000 kg (22,046 lb) on water, or up to 70 men. The crew compartment at the front of the vehicle is fully sealed against NBC (Nuclear, Biological, Chemical) contaminants.

Soviet Naval Infantry

Certainly an elite amongst the Soviet armed forces, the Naval Infantry are trained to operate far in advance of a major assault, usually by means of small-scale, disruptive amphibious operations along an enemy's coastal flank.

In the Soviet Union, as in almost every other country, the marines come under the operational control of the navy. In the West it is often thought that it is only in recent years that the Soviet marines have been established, although in fact the first 10 companies were formed by Tsar Peter the Great. After the 1917 revolution the marines virtually disappeared, although they were certainly employed in small numbers during World War II. In the 1960s the Soviet navy was given a new lease of life and in 1962 Admiral of the Soviet Fleet Gorshkov ordered the marines' reactivation.

Today the Soviet marines or, to give them their correct name, the Naval Infantry, are some 14,500 men strong and formed into five infantry brigades or regiments. The Northern, Baltic and Black Sea Fleets each have one infantry brigade, while the Pacific Fleet (based at Vladivostok) has two infantry brigades/ regiments formed into one marine division. In each case the marines come under the operational control of the respective fleet commander.

Each naval infantry brigade/regiment normally has three infantry battalions and one tank battalion plus a number of specialized companies. Each infantry battalion has a battalion headquarters, an anti-tank platoon with 100-mm (3.94-in) T-12 towed anti-tank guns and AT-3 'Sagger'/AT-5 'Spandrel' wire-guided anti-tank weapons, six 120-mm (4.72-in) towed mortars and three amphibious rifle companies. Each of the latter has a headquarters unit, three rifle platoons and a machine-gun platoon, which are carried in BTR-60P 8×8 armoured personnel carriers. In recent years the BTR-60P with its open-topped troop compartment has been replaced in many units by the BTR-60PA (fully enclosed troop comparment) and BTR-60PB (fully enclosed troop compartment and turret-mounted machine-guns).

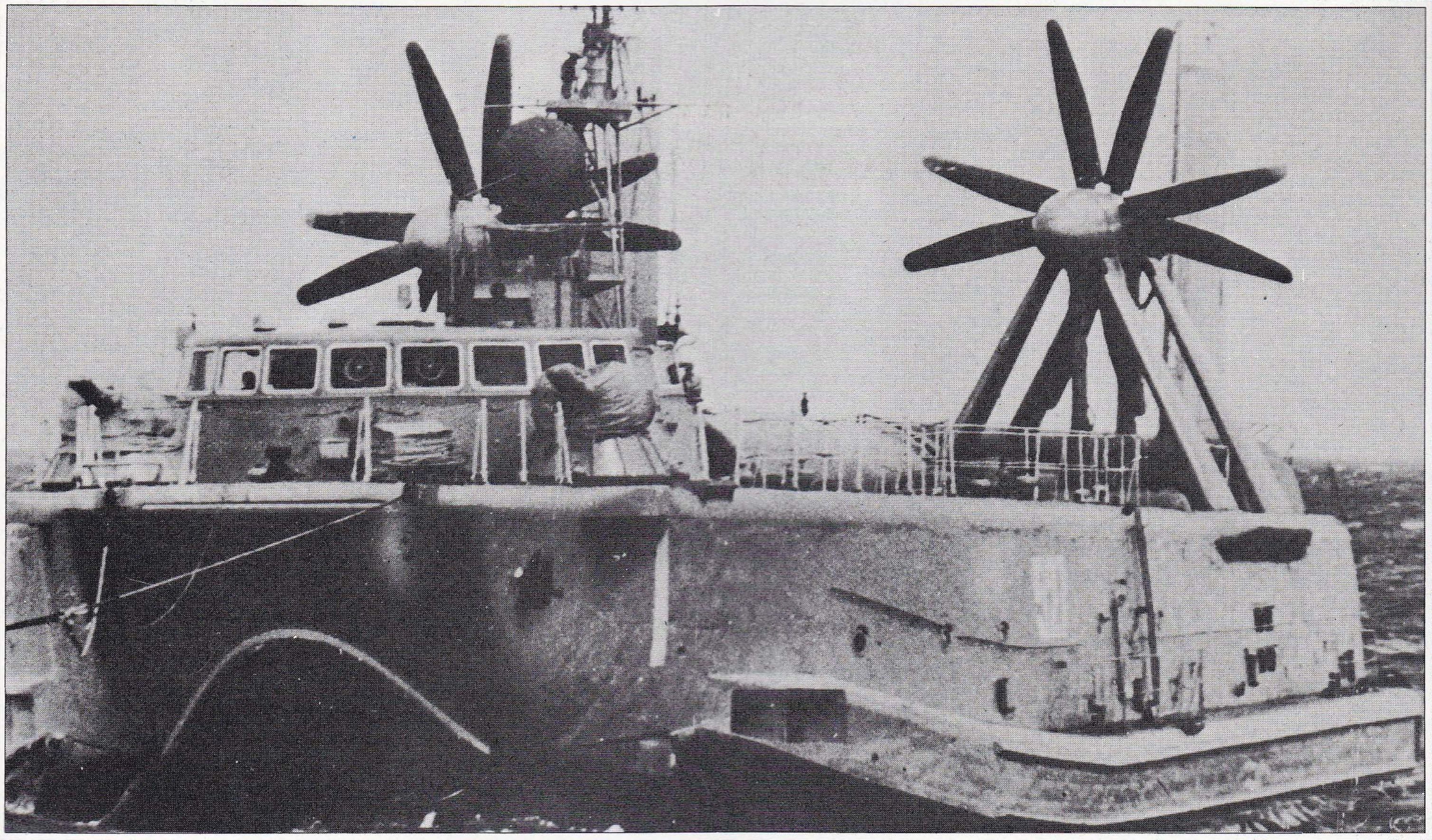
The tank battalion has a headquarters platoon with one PT-76 light amphibious tank, and three tank companies each with one PT-76 at company headquarters and three platoons each with three tanks; this gives the tank battalion a total of 13 tanks. For operational use one company of PT-76 tanks would probably be attached to the infantry battalion. The Naval Infantry has in the past relied on naval gunfire support when ashore, but in recent years has received some 122-mm (4.8-in) 2S1 amphibious self-propelled howitzers and 122-mm (4.8-in) BM-21 multiple rocket-launchers; air defence, previously limited to 7.62-mm (0.3-in) and 12.7-mm (0.5-in) machine-guns and SA-7 man-portable SAMs, has been strengthened by ZSU-23-4 self-propelled anti-aircraft guns and SA-9 surface-to-air missile systems.

The Soviet marines do not have sufficient men or equipment to carry out sustained landings, but would in time of war be used to establish a beach-head, the army then acting as the follow up force to exploit the beach-head thus obtained. More recently it has been reported that each of the five infantry brigades has received a helicopter company, which would give greater flexibility and allow small detachments of marines to be landed inland to stop enemy reinforcements reaching the beach-head area until it had been secured.

In addition to providing the Soviet marines with new equipment, the Soviet navy has been increasing its capability to transport the marines to combat areas. Amphibious forces now available include at least two of the new 'Ivan Rogov' class of LPD, 17 of the 'Ropucha' class of LST, and 14 of the 'Alligator' class of LST. The 'Ivan Rogov' class ships can each lift a complete infantry battalion and some 20 tanks, rapid ship-to-shore transport being carried out by helicopters (the ship has one landing pad fore and aft), two 'Lebed' class air-cushion vehicles and one 'Ondatra' class LCM carried in the rear docking bay. Equipment can also be offloaded through the bow doors. Air-cushion vehicles are also used to transport Naval Infantry quickly ashore, the huge 'Aist' class craft each carrying four PT-76 light tanks and 150 troops at a speed of some 60 knots. The 'Lebed' class craft can each carry two PT-76s, or 40 tonnes of cargo or 120 troops, while the smaller 'Gus' class craft can each carry 25 troops and their equipment.

Right: Like the majority of their land counterparts, the Naval Infantry are equipped with the BTR-60 APC, which has a useful amphibious capability. Propelled by a single water jet at the rear of the hull, it can travel at up to 10 km/h (6 mph).

Below: The Soviet Union has been alone among the major powers in its large-scale use of hovercraft, despite the concept being ideally suited to amphibious operations. The 'Aist' class can carry up to 150 troops and two PT-76 light tanks.



Above: The rapid expansion of the Soviet navy has given the country's amphibious capability a much-needed boost, but as yet only small numbers of troops can be blue-water-deployed for any length of time.

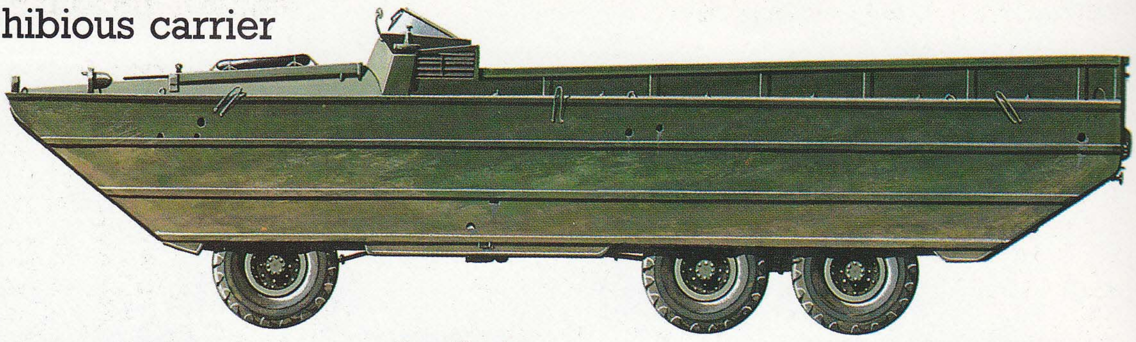
Right: Ivan Rogov *is the first assault ship with anything like the capabilities of a US Navy LPD. First seen in 1978, she can accommodate a small battalion (550 men) of infantry as well as 30 APCs and up to 10 tanks.*

Above: In their major wartime role, the Soviet marines plan to come ashore at selected points, to establish a bridgehead and to hold until regular reinforcements arrive (usually by ship). Their equipment today includes both tanks and self-propelled artillery.

Below: With fixed bayonets, a platoon leaps into action from its PTS tracked amphibian. Although small in numbers, a battalion of Soviet naval infantry is regarded by many to be amongst the most effective forces of its size in the current Soviet armed forces.

USSR

BAV-485 amphibious carrier



Following the successful use of American-supplied DUKW 6×6 amphibious vehicles by the Soviet army during World War II, it was decided to build a similar vehicle but based on a Soviet truck chassis. This finally appeared in the early 1950s as the **BAV-485**, sometimes called the **ZIL-485**. The layout of the BAV-485 is similar to that of the American DUKW with the engine and transmission at the front, crew seats to the rear of the engine compartment, and the cargo area at the rear. A maximum of 2500 kg (5,511 lb) of cargo or 25 fully equipped troops can be carried. The crew at the front are provided with a windscreen which can be folded forwards, and if required bows and a tarpaulin cover can be erected over the crew and troop compartments. A major improvement over the original American DUKW is the installation of a drop-down tailgate at the very rear of the cargo compartment, which enables light vehicles, mortars and light artillery weapons to be loaded very quickly. The engine is coupled to a manual gearbox with five forward and one reverse gear, and a two-speed transfer case. The main brakes are pneumatic, with a mechanical parking brake that operates on the rear wheels only. The BAV-485 is powered in the water by a single three-blade propeller mounted under the rear of the hull, and before the vehicle enters the water bilge pumps must be switched on.

The basic BAV-485 was based on the ZIL-151 6×6 2500-kg (5,511-lb) truck chassis built by the Likhachev Motor Vehicle Plant in Moscow between 1947 and 1958. Later production vehicles were based on the ZIL-157 6×6 2500-kg (5,511-lb) truck chassis built at the same plant between 1958 and 1961, this model being designated the **BAV-485A**. The major difference between the BAV-485 and the later BAV-485A is that the former has external air lines for the central tyre pressure-regulation system while the latter has internal air lines which are less easily damaged. The central tyre pressure-regulation system is a common feature on Soviet wheeled armoured vehicles and military trucks, and enables the driver to adjust the ground pressure to suit the ground being crossed. It is by no means a new idea, however, as the Americans had a similar system on their DUKWs during World War II. Some BAV-485s have been observed with a 12.7-mm (0.5-in) DShKM heavy machine-gun for anti-aircraft defence, this being mounted on the forward right side of the troop compartment.

Specification

BAV-485

Crew: 1+1

Combat weight: on land and on water 9650 kg (21,275 lb)

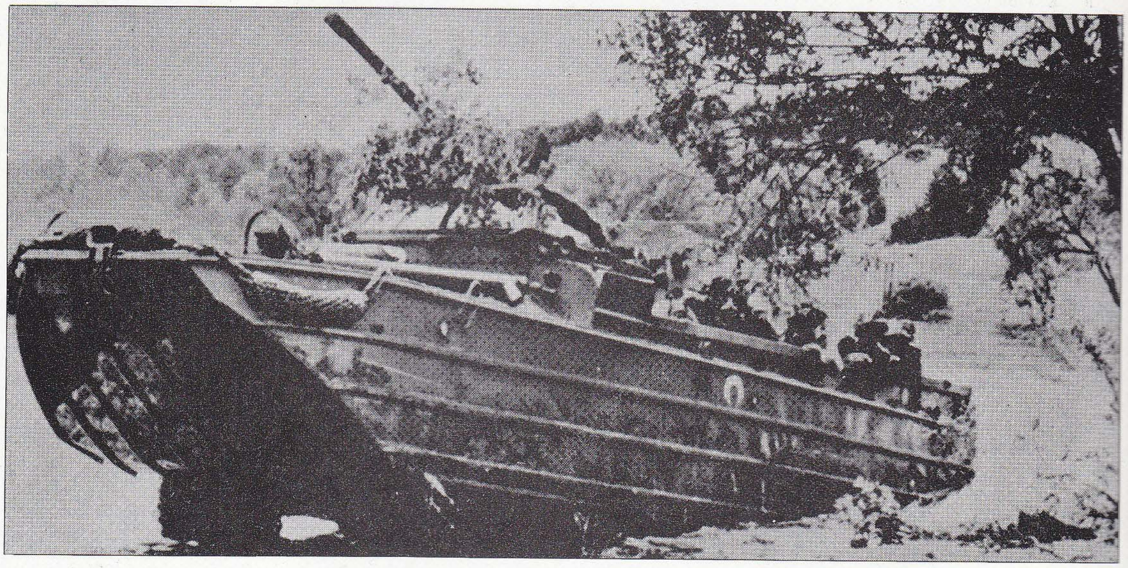
Powerplant: one ZIL-123 6-cylinder petrol engine developing 110 hp (82 kW)

Dimensions: length 9.54 m (31 ft 3.6 in); width 2.845 m (9 ft 4 in); height 2.66 m (8 ft 8.7 in)

Performance: maximum road speed 60 km/h (37.3 mph); maximum water speed 10 km/h (6.2 mph); maximum road range 480 km (298 miles); fording amphibious; gradient 60 per cent; vertical obstacle 0.4 m (1 ft 4 in); trench not applicable

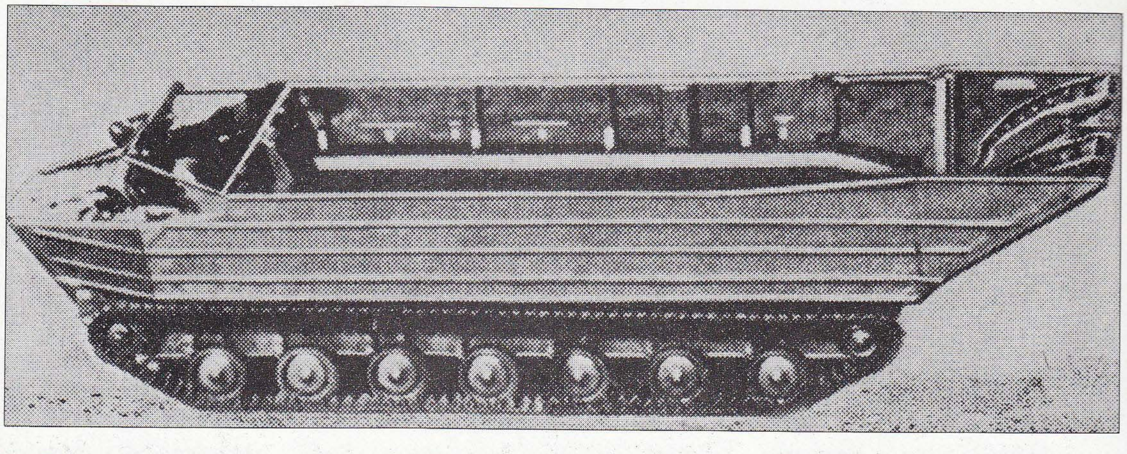
Derived directly from the wartime 6×6 DUKW provided under Lend-Lease, the BAV-485 is a watertight boat-like body on a Soviet truck chassis.

Based upon ZIL trucks, the BAV-485 largely serves in second-line units of the Warsaw Pact.



USSR

K-61 amphibious carrier



The view from above displays the large capacity and the loading ramps incorporated into the tailgate. Normal load can include trucks, artillery pieces or mortars.

The **K-61** tracked amphibious load carrier was developed in the period immediately after World War II and can carry a maximum payload of 3000 kg (6,614 lb) on land and 5000 kg (11,023 lb) on water; in the troop transport role it can carry a maximum of 60 fully equipped troops. The K-61 was first seen in Soviet army use in the early 1950s, and was subsequently exported to most members of the Warsaw Pact as well as to Egypt and Vietnam. Egypt used the K-61 in the 1973 Middle East conflict to carry supplies across the Suez Canal. In Soviet front-line units the K-61, which is sometimes known as the **GPT**, has been replaced by the more recent PTS tracked amphibious vehicle, which has not only a greater payload capacity but also a higher road speed and increased operating range.

The K-61 tracked amphibious carrier has an all-steel hull with the engine and crew compartment at the very front. The cargo/troop area runs almost the whole length of the K-61, and to facilitate the loading of vehicles a large tailgate is provided. To protect the crew and cargo against bad weather, bows and a tarpaulin cover can be fitted over the whole of the cargo area. The suspension on each side consists of seven very small road wheels with the drive sprocket at the front and idler at the rear, and there are seven slides to support the tracks as they return.

The K-61 is driven in the water by two propellers mounted under the hull rear, these being driven by a power take-off from the main engine.

In addition to carrying troops and cargo, K-61 vehicles have been used to carry a wide range of engineer equipment and weapons such as the

122-mm (4.8-in) M1938 (M30) towed howitzer, 76-mm (3-in) or 85-mm (3.35-in) anti-tank guns, mortars, 14.5-mm (0.57-in) ZPU-2 twin and ZPU-4 quadruple towed anti-aircraft guns, and light vehicles such as the GAZ-63. For heavier equipments one K-61 would carry the weapon while another ferried the towing vehicle.

Specification

K-61

Crew: 1+1

Combat weight: on land 12550 kg (27,668 lb) and on water 14550 kg (32,077 lb)

Powerplant: one YaAZ-M204VKr 4-cylinder water-cooled diesel developing 135 hp (100 kW)

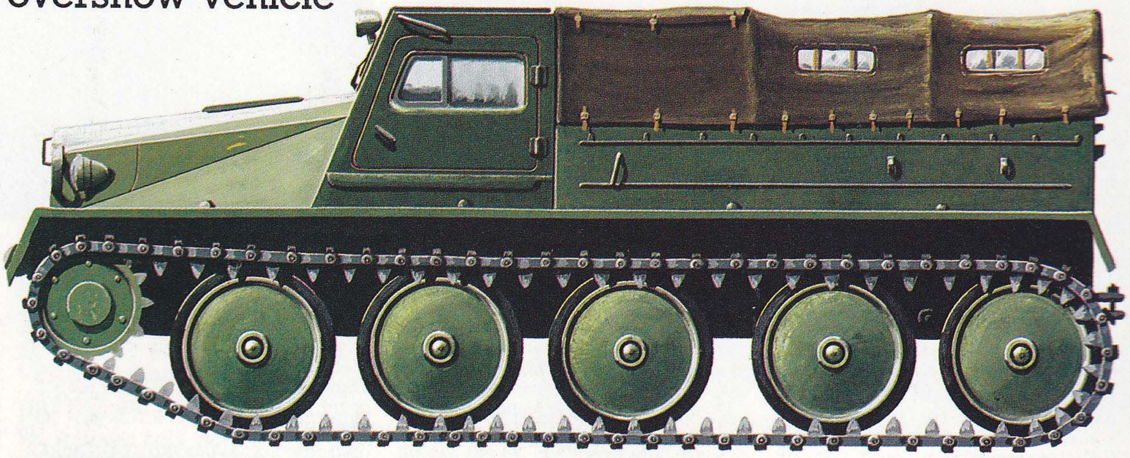
Dimensions: length 9.15 m (30 ft 0.2 in); width 3.15 m (10 ft 4 in); height 2.15 m (7 ft 0.6 in)

Performance: maximum land speed 36 km/h (22 mph); maximum water speed 10 km/h (6.2 mph); maximum range 260 km (162 miles); fording amphibious; gradient 40 per cent; vertical obstacle 0.65 m (2 ft 1.6 in); trench 3 m (9 ft 10 in)

East Germany has the K-61 on its inventory, as have most of the Warsaw Pact nations. It has seen combat service with Egypt, in 1973, and also equips the Vietnamese army.

USSR

GT-S tracked oversnow vehicle



Wartime experience with fighting in the snow led to the development of the GAZ-47, or GT-S oversnow vehicle. The 1000-kg (2,205-lb) payload makes the GT-S equivalent to a light truck.

The **GT-S**, sometimes called the **GAZ-47**, is believed to have been the first tracked amphibious oversnow vehicle to enter service with the Soviet army after World War II. During this conflict the Soviet army used a number of oversnow vehicles including several sled-type vehicles with a propeller at the rear. The GT-S was designed to carry a maximum payload of 1000 kg (2,205 lb) and to tow a trailer (or weapon such as a 120-mm/4.72-in mortar) weighing up to 2000 kg (4,409 lb).

The engine, more commonly the GAZ-61, is at the very front of the vehicle and coupled to a manual gearbox with four forward and one reverse gear. Some vehicles were fitted with the less powerful GAZ-47. The commander and driver are seated to the immediate rear of the engine, and behind them is the cargo area extending to the very rear of the vehicle. This cargo area is normally covered by a tarpaulin cover with small windows in the sides and rear. The tracks are 300 mm (11.81 in) wide and give a ground pressure of 0.24 kg/cm^2 (3.4 lb/sq in) loaded. The suspension is of the torsion-bar type and consists of five large rubber-tyred road wheels, the last road wheel on each side acting as the idler, and a drive sprocket at the front; there are no track-return rollers. As with the later oversnow vehicles, the GT-S is fully amphibious without preparation, being propelled in the water by its tracks.

One of the more interesting versions of the GT-S was the **LFM-RVD-GPI-66**, on which the tracks are replaced by cylindrical steel pontoons powered by the main engine. This model has a much higher water speed of 20 km/h (12.4 mph), but is wholly impractical on hard surfaces such as roads.

The GT-S has been replaced in production by the **GT-SM**, which has a longer chassis with six instead of five road wheels, and is powered by a more powerful GAZ-71 V8 water-cooled petrol engine developing 115 hp (86 kW). This gives it higher road and water speeds, and the vehicle's wider tracks give a lower ground pressure and therefore better mobility across snow and swampy ground.

Specification

GT-S

Crew: 1+1

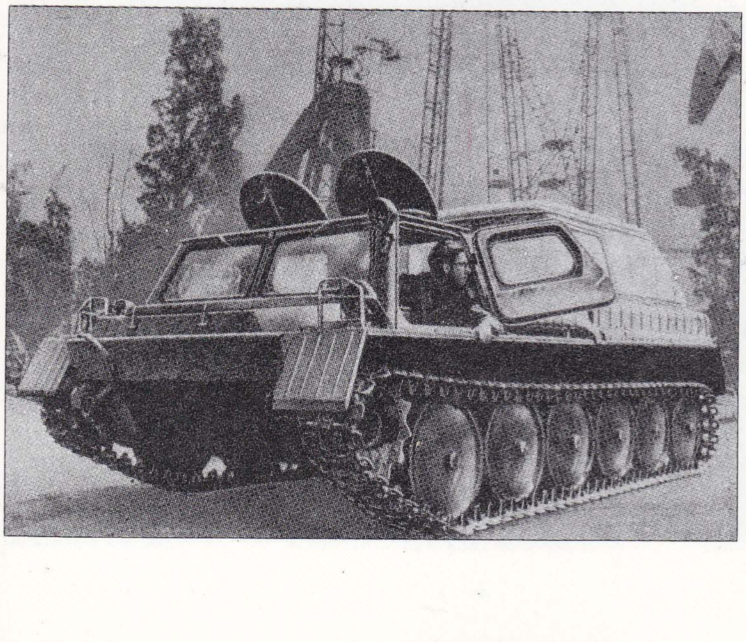
Combat weight: 4600 kg (10,141 lb)

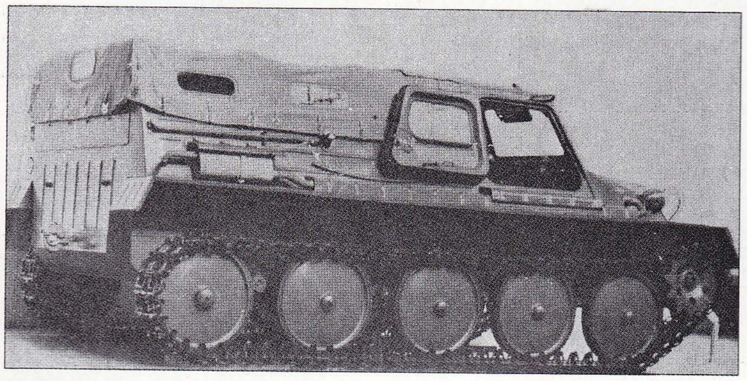
Powerplant: one GAZ-61 6-cylinder water-cooled petrol engine developing 85 hp (63 kW)

Dimensions: length 4.90 m (16 ft 1 in); width 2.435 m (8 ft 0 in); height 1.96 m (6 ft 5.2 in)

Performance: maximum road speed 35 km/h (21.7 mph); maximum water speed 4 km/h (2.5 mph); maximum range 725 km (450 miles); fording amphibious; gradient 60 per cent; trench 1.3 m (4 ft 3.2 in); vertical obstacle 0.6 m (1 ft 11.6 in)

The GT-SM is an enlarged and more powerful version of the GT-S, with six road wheels per side instead of the five of the earlier model. It is in extensive Soviet service.

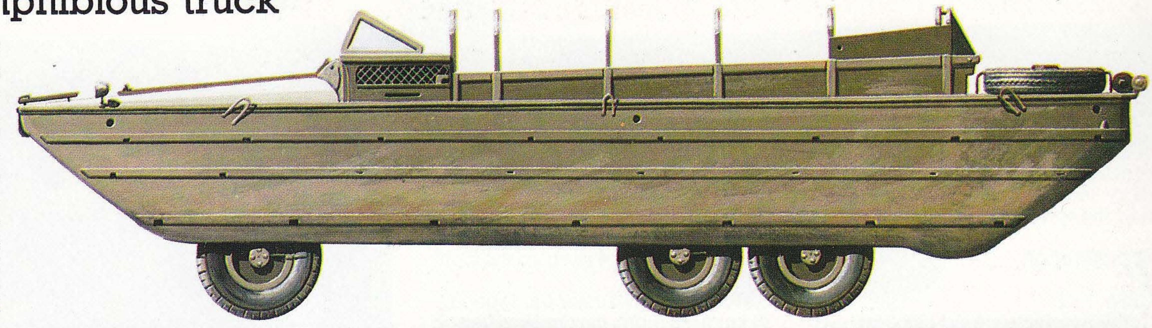




Above: Fully amphibious without prior preparation, the GT-S has been in service since 1955, and was manufactured until 1970. It is being replaced by the enlarged GT-SM.

BRAZIL

CAMANF amphibious truck

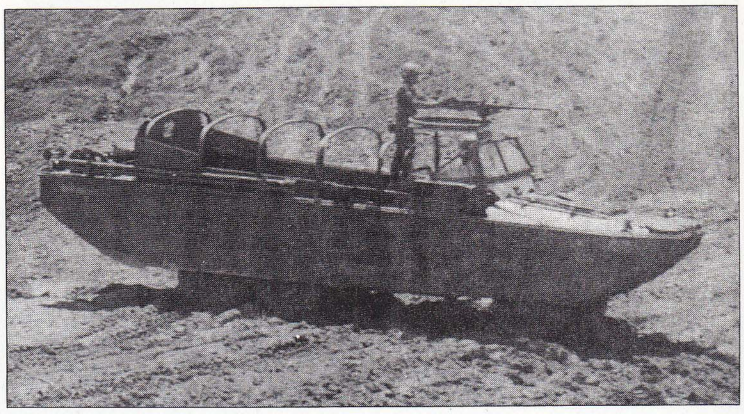


Having used the DUKW for many years, the Brazilian replacement is virtually identical, but with minor modifications to suit Brazilian maritime requirements. Maximum water speed is 14 km/h (8.7 mph).

The Brazilian marines come under operational control of the Brazilian navy and have about 15,000 men organized into one amphibious division, one reinforcement command and an internal security force. Its vehicles include ENGESA EE-11 Urutu amphibious armoured personnel carriers, EE-9 Cascavel armoured cars, LARC-5 4×4 amphibious cargo-carriers and **CAMANF** amphibious trucks. On order are a small number of FMC LVTP7A1 amphibious armoured assault vehicles from the USA.

After the end of World War II Brazil was supplied with a number of American DUKW 6×6 amphibious vehicles, but by the 1970s these were becoming difficult to maintain and operate, and as with all petrol-engined vehicles there was the ever-present risk of fire. Biselli Viaturas e Equipamentos Industriais of Sao Paulo had for some time been supplying the Brazilian armed forces with equipment, including tank transporters, and in the mid-1975s started design work on the CAMANF (Caminhao Anfibio, or amphibious truck) and in the late 1970s the first batch of 15 vehicles was delivered to the Brazilian marines. The vehicle is essentially a 6×6 version of a Ford F-7000 chassis fitted with a watertight body. Some sources have indicated that it is almost identical to the original American body with modifications to suit the requirements of the Brazilian marines, including a much stronger bow to enable the vehicle to operate in rougher water and to push beached landing craft back into the water.

In appearance the CAMANF is almost identical to the American DUKW designed in the early days of World War II, with the engine compartment at the front and the crew and troop compartment towards the rear. The cargo area is provided with removable bows and a tarpaulin cover, and a ring-mounted 12.7-mm (0.5-in) M2 HB anti-aircraft machine-gun can be fitted over the right side of the crew compartment. The vehicle can carry a load of 5000 kg (11,023 lb) on land and very calm water, but in rougher water it is limited to 2500 kg (5,511 lb). Before entering the water a trim vane is erected at the front of the vehicle and the bilge pumps are switched on. The CAMANF is propelled in the water by a single propeller mounted under the rear of the hull. All six wheels are fitted with a tyre pressure-regulation system that allows the commander to adjust the tyre pressure to suit the type of ground being crossed. Tyres are all 9.00×20, and a spare wheel and tyre are carried on the rear of the vehicle.



The 5000-kg (11,023-lb) payload of the CAMANF is considerably reduced in rough water, but the bow has been strengthened so that handling in such conditions is improved.

Specification
CAMANF
Crew: 1+2
Combat weight: 13500 kg (29,762 lb)
Powerplant: one Detroit-Diesel Model 40-54N diesel engine
Dimensions: length 9.50 m (31 ft 2 in); width 2.50 m (8 ft 2.4 in); height 2.65 m (8 ft 8.3 in)
Performance: maximum road speed 72 km/h (45 mph); maximum water speed 14 km/h (8.7 mph); maximum road range 430 km (267 miles); fording amphibious; gradient 60 per cent; trench not applicable; vertical obstacle 0.4 m (1 ft 3.7 in)

SPAIN

Pegaso VAP 3550/1 amphibious vehicle

In Spain, as in most countries the marines come under the operational control of the navy. Today the Spanish marines consist of a force of about 12,000 men organized into five garrison regiments and one regiment that comprises two infantry, one support and one logistics battalion. Equipment includes M48 tanks, LVTP7 amphibious assault vehicles, 106-mm (4.17-in) recoilless rifles, 105-mm (4.13-in) OTO Melara pack howitzers, 105-mm (4.13-in) M52 self-propelled howitzers and **Pegaso VAP 3550/1** amphibious vehicles. The last was designed by ENASA to meet the requirements of the Spanish navy for an amphibious wheeled vehicle that could be launched from a Landing Ship Tank (LST) while carrying a payload of 3000 kg (6,614 lb), reach the coast under its own power and then travel inland to a point where the cargo would be unloaded with the assistance of an onboard crane.

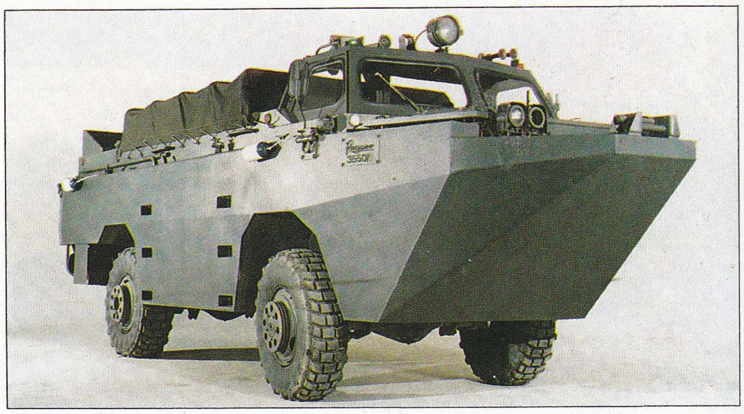
The VAP 3550/1 uses many of the automotive components from the Pegaso 3045 4×4 and Pegaso 3050 6×6 series of trucks which have been produced in large numbers for the Spanish army, navy, air force and marines over the last 15 years. This makes for easier training and reduced maintenance.

The hull of the VAP 3550/1 is of all-welded steel construction with a maximum thickness of 6 mm (0.24 in), and is divided into a number of watertight compartments; if any one of these is punctured the vehicle will not sink. The crew compartment is towards the front of the vehicle, with the driver seated on the left and the other two crew members to his right; the top, front and sides of the crew compartment are covered, but the back is open. The cargo compartment is in the centre and is normally fitted with removable bows and a tarpaulin cover; there is no provision for loading wheeled vehicles, the normal role of the vehicle being the carriage of bulk cargo. To the rear of the cab is a hydraulic crane with an extending jib which can lift a maximum load of 350 kg (772 lb).

The engine compartment is at the rear with the air inlet/air outlet louvres and exhaust pipe mounted above it. The engine is coupled to a manual gearbox with six forward and one reverse gear and a two-speed transfer case. Steering is power-assisted on the front wheels.

Unlike many amphibians, which are impelled on the water by propellers, the VAP 3550/1 is powered by two waterjets, one mounted on each side of the hull rear, and these give excellent waterborne manoeuvrability. The vehicle is also fitted with two automatic bilge pumps with a maximum capacity of 3600 litres (792 Imp gal) per hour and two pumps with a maximum capacity of 6000 litres (1,320 Imp gal) per hour, while at the very front is a winch with a capacity of 4500 kg (9,921 lb) for self-recovery operations.

In addition to serving with the Spanish navy and marines, the type has been exported: seven were delivered to Mexico in 1982, and a quantity is reported to have been supplied to Egypt. The Italian company Astra has a licence to build this vehicle.



Designed to operate from Spanish navy LSTs (Landing Ships Tank), the Pegaso VAP 3550/1 is powered in water by two waterjets driving the vehicle at some 55 kts when afloat. Standard payload is 3000 kg (6,614 lb).

Specification
Pegaso VAP 3550/1
Crew: 1+2
Combat weight: 12500 kg (27,558 lb)
Powerplant: one Pegaso 9125/5 diesel developing 190 hp (142 kW)
Dimensions: length 9.058 m (29 ft 8.6 in); width 2.50 m (8 ft 2.4 in); height to top of cab 2.50 m (8 ft 2.4 in)
Performance: maximum road speed 87 km/h (54 mph); maximum water speed 10 km/h (6.2 mph); range on land 800 km (497 miles); range on water 80 km (49.7 miles); fording amphibious; gradient 60 per cent; trench not applicable

USA

LVTP7 armoured amphibious assault vehicle

Storming ashore from their LVTP7 amphibians, these US Marines form part of the largest amphibious force in the world. Their armoured vehicle is an important component in US power projection capabilities.

After the evaluation of a number of proposals for a new armoured amphibious assault vehicle to replace the LVTP5 family, the FMC Corporation was awarded a development contract by the Naval Ship Systems Command and the first of 15 **LVTPX12** prototypes were completed in 1967. Following trials, the vehicle was standardized as the **LVTP7 (Landing Vehicle Tracked Personnel Model 7)**, and in 1970 FMC was awarded a contract for 942 vehicles at total value of $78.5 million. The first vehicles were completed in 1971 and production continued until 1974. In addition to the US Marine Corps, sales of the LVTP7 and its variants were also made to Argentina (21), Italy (25), South Korea (61), Spain (19), Thailand (23) and Venezuela (11). The type's only combat use, apart from peacekeeping duties in Lebanon, has been with the Argentine marines during the 1982 invasion of the Falklands, when one vehicle was knocked out by the Royal Marines with a Carl Gustav light anti-tank weapon.

More recently the LVTP7A1 has entered production for the US Marines, and most of the original LVTP7 vehicles are to be brought up to this improved standard, which includes replacement of the original Detroit-Diesel engine by a Cummins diesel, and incorporation of passive night-vision devices, a smoke-generating capability, a fire-suppression system, improved ventilation for the troop compartment, a Position Location and Reporting System and improvements to the 12.7-mm (0.5-in) weapon station. For trials purposes three LVTP7 vehicles have recently been fitted with a one-man turret armed with a 40-mm grenade-launcher and a 12.7-mm (0.5-in) machine-gun, but no production orders have yet been placed.

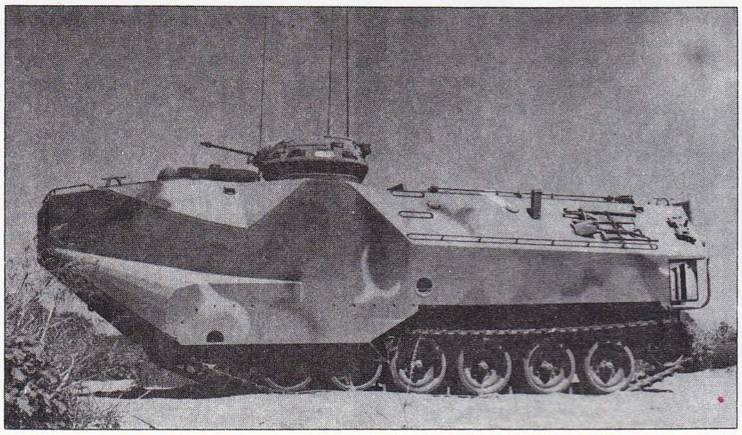
The LVTP7 has a hull of all-welded aluminium construction with the driver at the front on the right and the vehicle commander to his rear. The engine and transmission are at the front, with the one-man turret (armed with a 12.7-mm/0.5-in machine-gun) on the right; 1,000 rounds of ammunition are carried for this weapon. The troop compartment is at the rear of the vehicle, and the normal means of entry and exit to this is a large power-operated ramp in the hull rear. Over the top of the troop compartment is a three-part roof hatch that opens sideways to enable cargo and troops to be loaded when the vehicle is alongside ships. The 25 marines are seated on three bench seats, one down each side of the hull and one in the centre; the last can be folded to enable up to 4536 kg (10,000 lb) of cargo to be carried.

Suspension of the LVTP7 is of the torsion-bar type, and consists of six dual rubber-tyred road wheels, with a drive sprocket at the front and idler at the rear; there are no track-return rollers. When afloat the vehicle is normally propelled by two waterjets at the hull rear, one on each side, but if these fail the LVTP7 can also be propelled by its tracks at the slower speed of 7.2 km/h (4.5 mph).

On the basic hull of the LVTP7 several specialized versions of the vehicle have been developed. The command model, the **LVTC7**, has extensive communications equipment and a 12-man crew. The recovery member of the family is the **LVTR7**, which is fitted with a winch for recovery of vehicles, a crane for changing components in the field, and a complete set of tools and other specialized equipment. There was to have been an engineer vehicle with hydraulically-operated dozer blade (at the front of the hull) and a mine-clearing system, but this was not placed in production although a prototype was built. There was also to have been a 105-mm (4.13-in) howitzer model to replace the LVTH6, but this did not reach even the prototype stage. Undergoing trials in 1984 was an LVTP7 with the turret of the Sheridan light tank armed with a 105-mm (4.13-in) gun. The chassis of the LVTP7 was also used as the basics-for the **Mobile Test Rig** which was armed with a laser to shoot down aircraft. This was successfully tested in the mid-1970s but did not enter service.

Specification

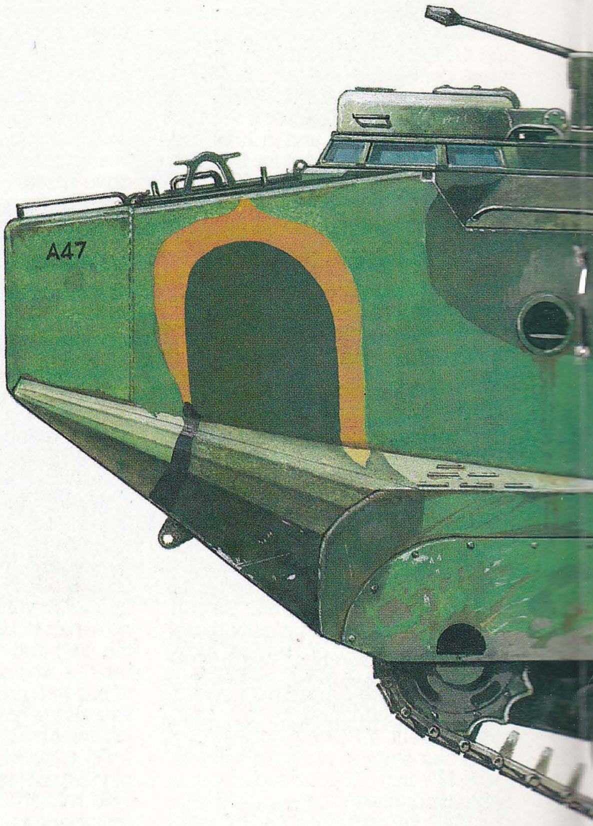
LVTP7
Crew: 3+25
Combat weight: 22837 kg (50,348 lb)
Powerplant: one Detroit-Diesel Model 8V-53T developing 400 hp (298 kW)
Dimensions: length 7.943 m (26 ft 0.7 in); width 3.27 m (10 ft 8.7 in); height overall 3.263 m (10 ft 8.5 in)
Performance: maximum road speed 64 km/h (40 mph); maximum water speed 13.5 km/h (8.5 mph); maximum road range 482 km (300 miles); fording amphibious; gradient 60 per cent; trench 2.438 m (8 ft 0 in); vertical obstacle 0.914 m (3 ft 0 in)



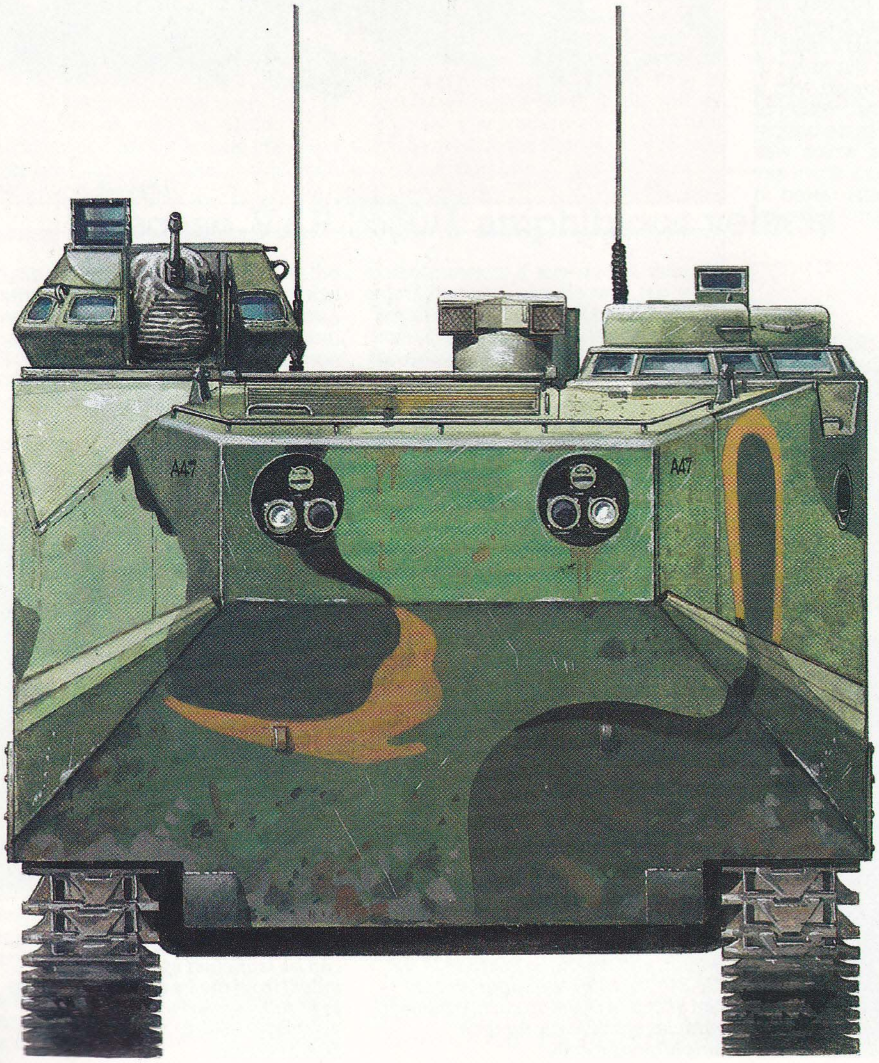
Left: The LVT7 series are not small vehicles, being 7.94 m (26 ft 1 in) in length, and weighing in at 22838 kg (50,348 lb). Only the superpowers can afford to develop such armoured vehicles specifically for their amphibious forces.

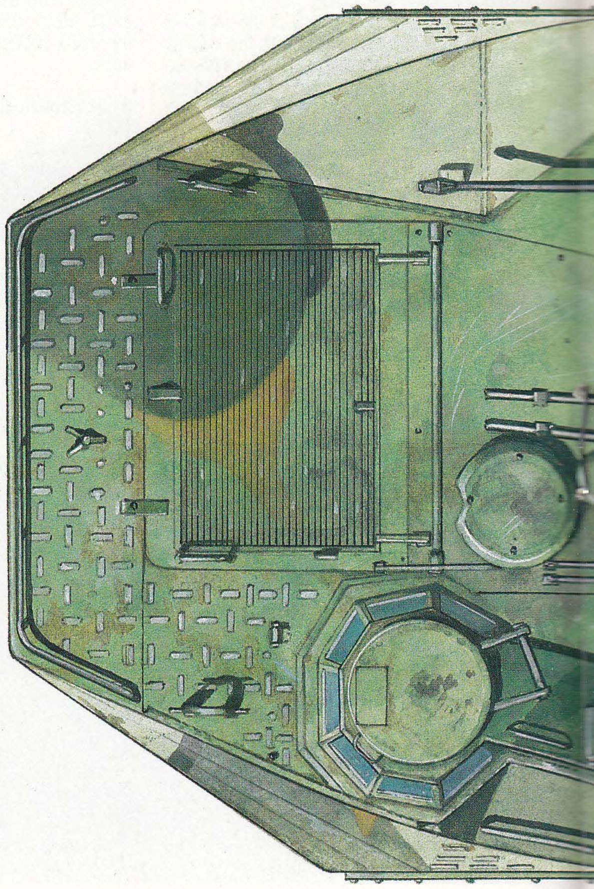
Above: With a seven-hour waterborne endurance, the LVTP7 can be launched up to 50 km (31 miles) from the beach, and carry up to 25 fully-armed troops or over 4500 kg (9,900 lb) of cargo in the basic version.

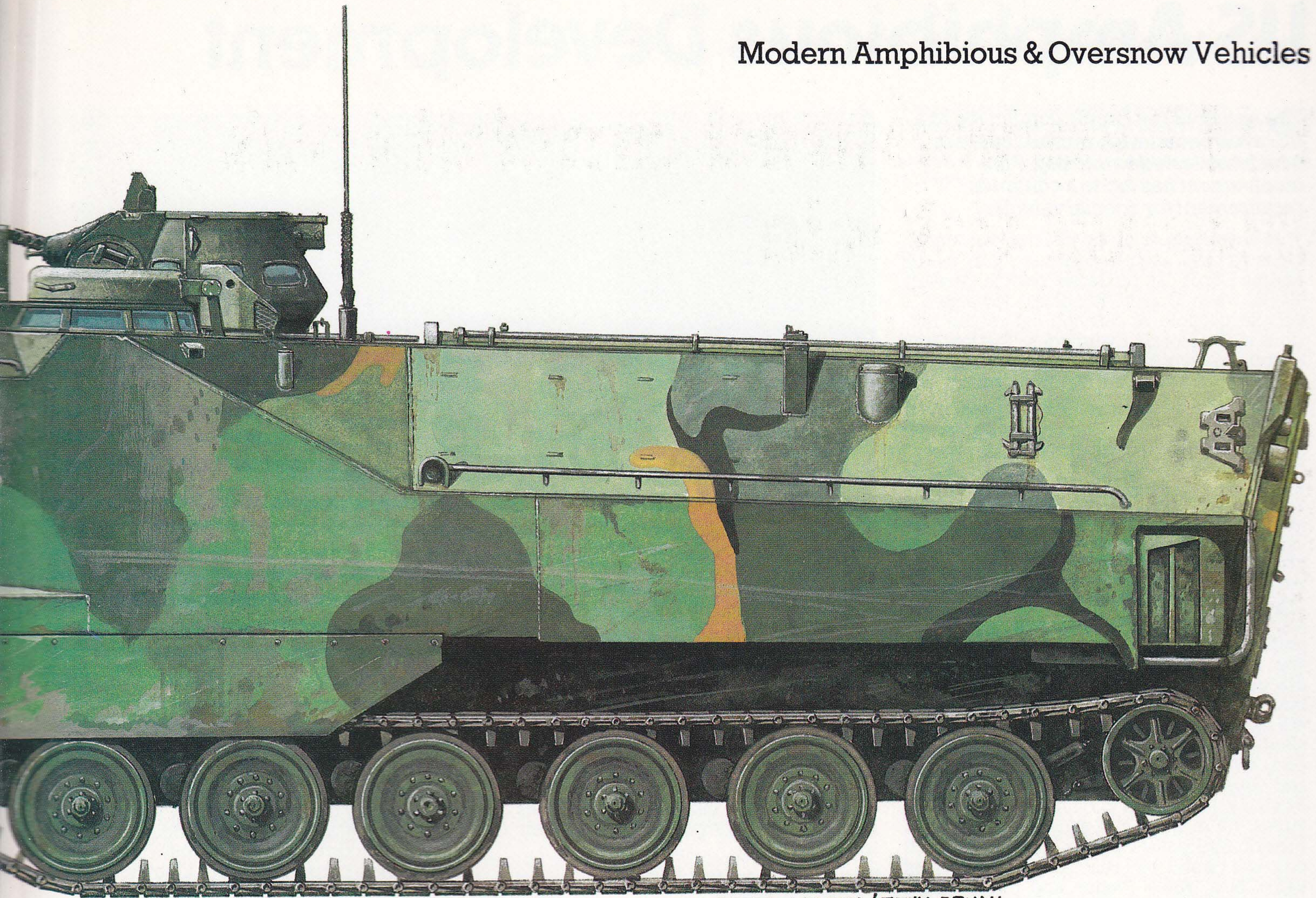
LVTP7 armoured amphibious assault vehicle

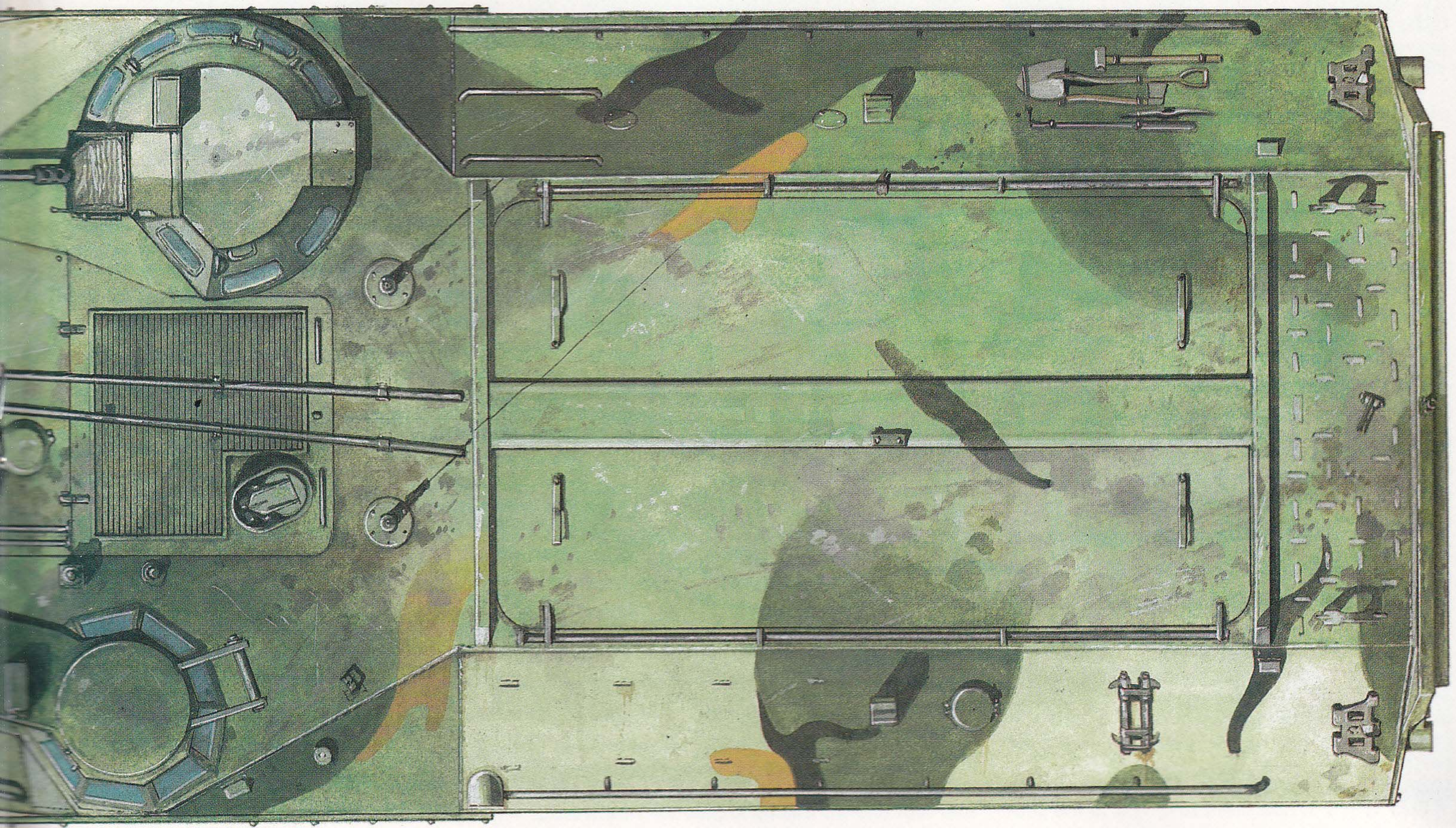


The LVTP7 has an all-welded aluminium hull with a maximum armour thickness of 45 mm on the hull sides, sufficient to protect the occupants from shrapnel or small arms fire. Twenty-five fully-equipped Marines can be carried, seated on three bench seats. They exit the vehicle through the power-operated ramp at the hull rear, which has a door in the left side in case of power failure. A Marine Corps Assault Amphibian battalion is equipped with 187 LVTP7s plus five LVTR7 recovery vehicles and 12 LVTC7 command models.






PETER SARSON / TONY BRYAN



US Amphibious Development

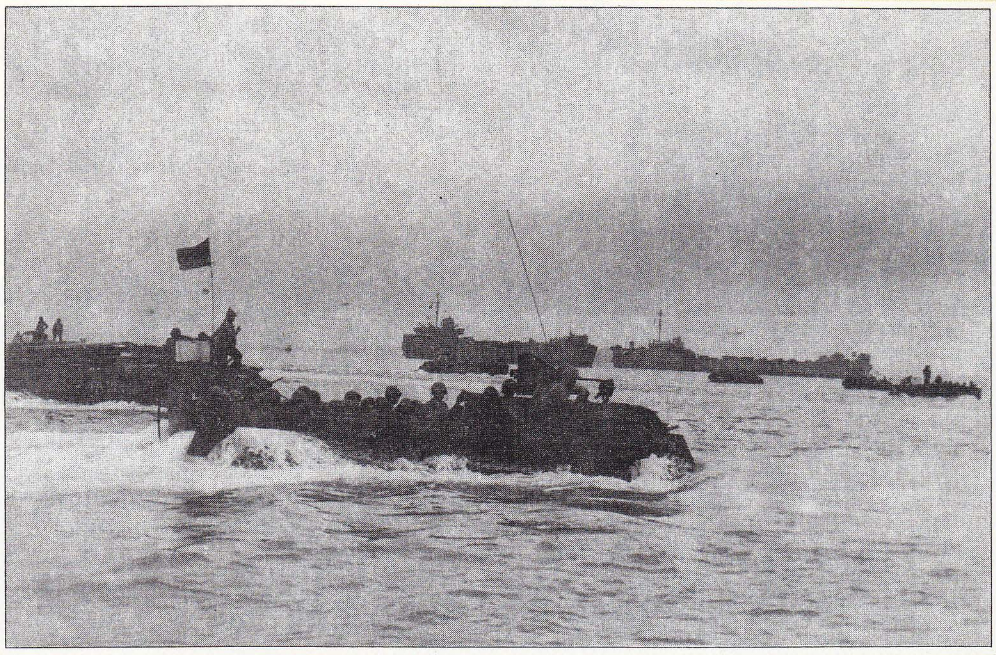
The nature of the Pacific conflict led to a US involvement with amphibious war which has lasted to this day. This involvement has led to a continual requirement for special vehicles.

The development of the full-tracked amphibious vehicles used so successfully by the US Marine Corps can be traced back to the early 1930s, when Donald Roebling developed a vehicle capable of carrying out rescue missions in the Florida Everglades. The first prototype was completed in 1935, and though possessing a land speed of 40 km/h (25 mph) was very slow in the water. Over the next four years further development was carried out and the water speed increased to 14.5 km/h (9 mph). The US Marine Corps subsequently ordered three improved vehicles, and quickly followed with a production order for 200 more. The latter was officially called the LVT1 (Landing Vehicle Tracked Model 1), but was more commonly known as the Alligator or Amtrack. The first models were unarmoured and used for carrying supplies, but armoured models were soon developed and the vehicles were used for amphibious assault operations. Later in the war, fire-support models were developed, the first with a turret-mounted 37-mm (1.46-in) gun but later models with the complete turret of the M8 howitzer motor carriage armed with a short-barrel 75-mm (2.95-in) howitzer. By the end of World War II no less than 18,620 LVTs had been built by four manufacturers at seven locations. In addition to being used by the US forces, LVTs were also supplied to the Free French, Nationalist Chinese and British. In the post-war period the French army used LVTs in Indo-China, while France and the UK used them during the 1956 invasion of Suez. The vehicles were also supplied post-war to Italy, the Netherlands, South Korea and Thailand; indeed, some reports state that they are still in service with the Philippines and Taiwan in 1984.

After the end of World War II some of the older LVTs were scrapped, but many others were rebuilt to continue in service until the arrival of the LVTP5 in the early 1950s. The LVT3 was fitted with a small machine-gun turret over its forward hull and provided with full overhead protection for the rear troop compartment to become known as the LVT3C. The LVA(A)5 used in the fire-support role with its 75-mm (2.95-in) howitzer was also modernized, and both of these types were used during the Inchon landings in Korea in September 1950.

The original LVTs suffered from a number of drawbacks apart from their poor armour protection: they were unreliable and prone to mechanical failure, the troop compartment had no overhead protection from shell bursts, and the troops had to leave the vehicle by climbing over the sides. Late production vehicles were fitted with a power-operated ramp at the hull rear which enabled troops and supplies to be unloaded quickly, and the type could also carry a Jeep or 57-mm (2.24-in) anti-tank gun.

Late in 1950 the Ingersoll Products Division of the Borg Warner Corporation was awarded a contract by the Bureau of Ships for the design, development and construction of prototypes of a new family of landing vehicle tracked. Design work started in January 1951, and by August 1951 the first prototype had been completed under the designation LVTPX1. The company was no stranger to LVTs, as during World War II it had been involved in the production of the LVT1, LVT2, LVT3 and LVT4. Production began under the designation LVTP5 (Landing Vehicle Tracked Personnel Model 5) in 1952 and continued until 1957, by which time 1,124 had been built by five companies. Baldwin-Lima-Hamilton built 91, FMG Corporation 313, Ingersoll 239, St Louis Car Manufacturing Company 425, and Pacific Car and Foundry 56.



Korea, 15 September 1950, and the first waves of the 1st Marine Division head into Inchon harbour aboard their World War II-vintage AMTRACs (Amphibious Tracked Vehicles).

The arrival of the LVTP5

The layout of the LVTP5 was very different from the original LVTs as the troop compartment was at the very front and the engine compartment at the very rear. The troops entered the vehicle via the hydraulically-operated ramp at the front, and a total of 34 fully equipped US Marines could be carried seated on bench seats, though in an emergency 45 could be carried standing up. With its seats folded up the LVTP5 could carry 5443 kg (12,000 lb) of cargo afloat or 8165 kg (18,000 lb) of cargo on land. Light vehicles and weapons could also be carried in the troop compartment, for example the 105-mm (4.13-in) M101 towed howitzer, its crew and 90 rounds of ammunition. When alongside a ship, cargo and men could be loaded via the large cargo hatches in the roof. The LVTP5 was powered by a Continental LV-1790-1 V12 water-cooled petrol engine developing 810 hp (604 kW) and coupled to a CD-850 series transmission. The vehicle had a maximum road speed of 48.28 km/h (30 mph) and a water speed of 19.3 km/h (12 mph), but because of its weight and high fuel consumption its range of operation on land was only 359 km (223 miles). When afloat the LVTP5 was propelled by its tracks, each of which had no less than 135 blocks, each of them with an inverted water grouser. As the LVTP5 had been rushed, into service during the Korean War many problems soon became apparent, and the vehicle proved very difficult to maintain. Many LVTPs were subsequently improved, being redesignated LVTP5A1. The basic vehicle had a three-man crew consisting of commander, driver and machine-gunner, the last in the turret over the forward part of the troop compartment and armed with a single 7.62-mm (0.3-in) machine-gun, for which 2,000 rounds of ammunition were carried.

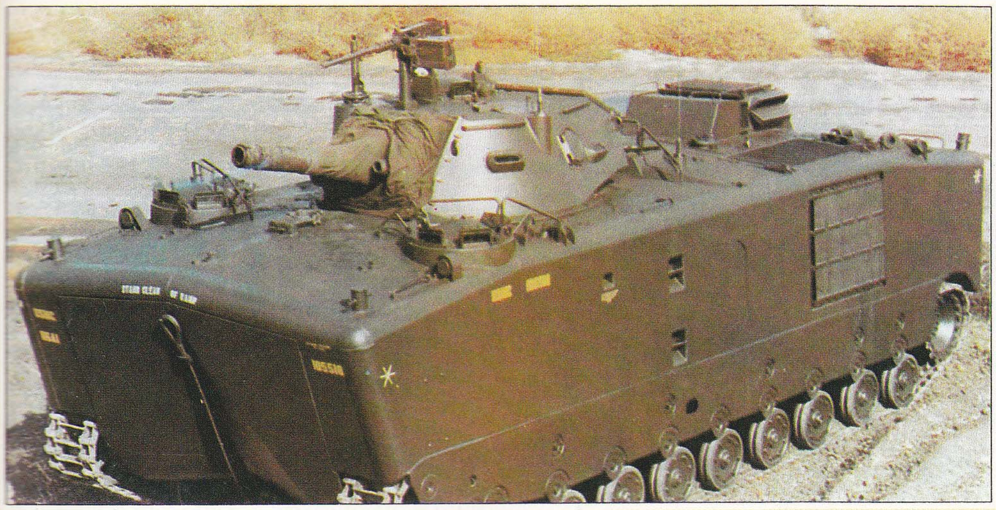
The LVTP5 was the basic member of a complete family of vehicles. The LVTH6 (Landing Vehicle Tracked Howitzer Model 6) was fitted over the troop compartment with a turret housing a short-barrel 105-mm (4.13-in) howitzer, a 7.62-mm (0.3-in) co-axial machine-gun and an external roof-mounted 12.7-mm (0.5-in) anti-aircraft machine-gun. When afloat, a total of 100 rounds of 105-mm, 1,000 rounds of 7.62-mm and 1,050 rounds of 12.7-mm ammunition were carried.

The command member of the family, the LVTC5 (Landing Vehicle Tracked Command Model 5), carried 12 men (a three-man crew plus nine command staff) and was fitted with extensive communications equipment. The recovery vehicle was the LVTR1 (Landing Vehicle Tracked Recovery Model 1) and was not fitted with a machine-gun turret; standard equipment included welding gear, an air compressor a generator, a lifting boom and a winch.

The LVTE1 (Landing Vehicle Tracked Engineer Model 1) was used to clear obstacles off the beach and was fitted with a special hydraulically-operated dozer blade on the front of the hull, together with a rocket-propelled mine-clearing system.

The LVTP5 series was used by the US Marine Corps in South Vietnam, but from 1971 was gradually replaced by the LVTP7 series, designed and built by the FMC Corporation. It was thought that all of the LVTP5s had been scrapped or expended as range targets, but it is now known that some were passed onto Chile, the Philippines and Taiwan and that these remain in service in 1984.

In addition to the previously mentioned production members of the LVTP5 family there were many trials vehicles. These included the LVTAAX1 anti-aircraft vehicle, which has the complete turret of the M42 Duster self-propelled anti-aircraft gun over the troop compartment; this turret is armed with twin 40-mm guns.



The LVT5 family was used for a variety of purposes, one member being the LVTH6 howitzer. The bulk of the vehicle is apparent from the relatively small appearance of the tank-sized 105-mm gun turret.

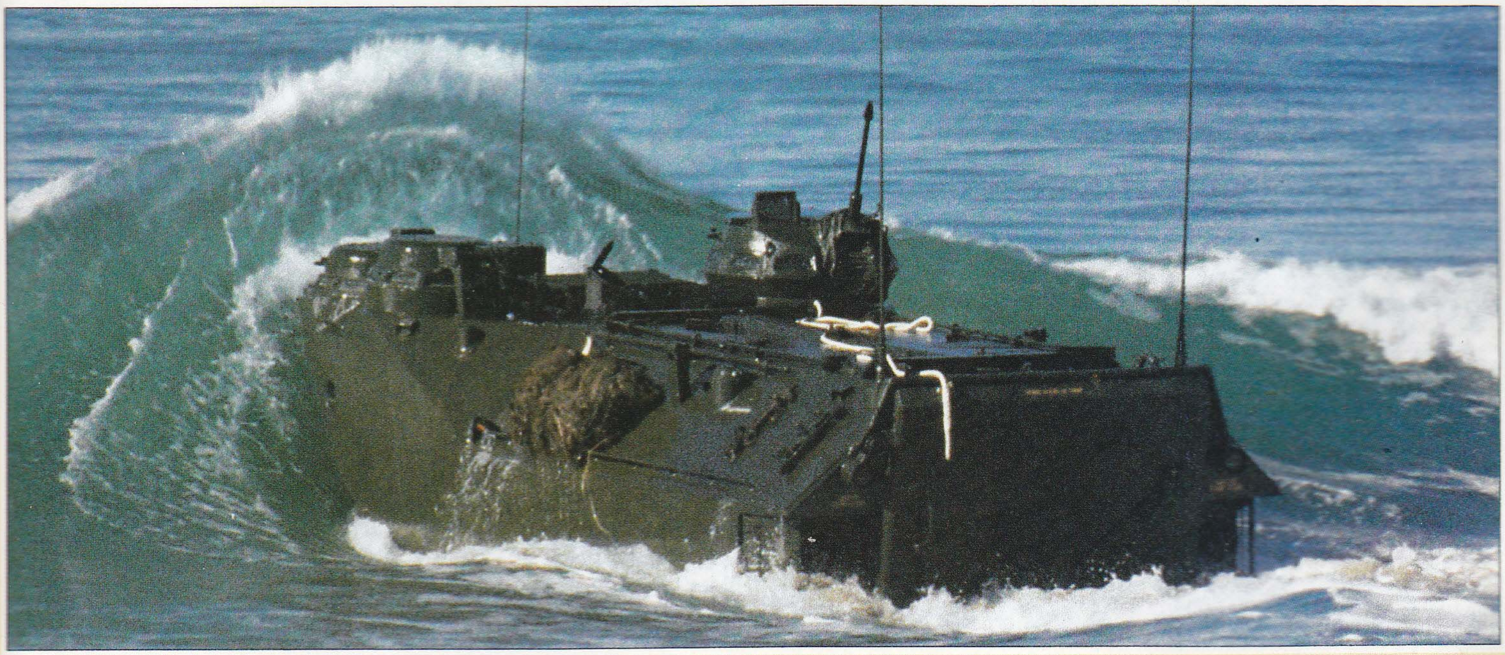
In the early 1950s the Ordnance Division of FMC Corporation, which had produced 11, 251 LVTs during World War II, built four prototypes of a full-tracked armoured amphibious troop carrier called the LVTPX2. This vehicle incorporated many automotive and suspension components of the M59 full-tracked armoured personnel carrier that the company was building for the US Army. The four prototypes were delivered to Camp Pendleton in February 1953, and each vehicle was put through 350 hours of endurance testing over all types of terrain and through heavy surf. These vehicles were then modified and further trials were carred out in 1954, 1955 and 1956, after which the type was declared standard and given the type designation LVTP6. In the end, however, the LVTP6 never entered production. The LVTHX4 was the fire-support vehicle and fitted with a turret armed with a 105-mm (4.13-in) howitzer. The LVTAAX2 was fitted with the twin 40-mm turret of the M42 self-propelled anti-aircraft gun (also fitted to the previously-described LVTAAX1 vehicle). A bolt-down 107-mm (4.2-in) mortar kit was also developed for the LVTP6, and projected versions included recovery, engineer and command vehicles.

While the LVTP5 was a major improvement over the original LVTs, it proved difficult to maintain and according to the US Marine Corps needed 22 hours of maintenance for every 100 hours of operation; it also had no less than 152 grease points.

The LVTP5 family has now been replaced by the LVTP7/LVTP7A1 series, which is fully described separately. This needs only six hours of maintenance for every 100 hours of operation, has only 29 grease points, a greater range of operation on land and water, and higher road and water speeds, the latter achieved by the use of two hull-mounted waterjets.

The LVTP7 series was to have been replaced by the Landing Vehicle Assault (LVA), and in 1976 the US Navy awarded conceptual design contracts to the Bell Aerospace Division of Textron Inc., to the FMC Corporation and to the Pacific Car and Foundry Company. The following year Curtiss-Wright was awarded a separate contract for the development of a stratified-charge rotary engine for the LVA. The original US Marine Corps requirement was for a vehicle with a water speed of between 40 and 64 km/h (25 and 40 mph), a land speed of between 64 and 88 km/h (40 and 55 mph), good operating range on both land and water, the ability to carry between 18 and 22 fully equipped troops, and the provision of a turret-mounted 25-mm cannon plus co-axial 7.62-mm (0.3-in) machine-gun. The idea was that two of the companies would be awarded further contracts which would eventually lead to the construction of full-scale mockups. But in 1979 the Landing Vehicle Assault was cancelled and contracts were subsequently awarded for the Landing Vehicle Tracked (Experimental), or LVT(X), to General Dynamics Land Systems Division, FMC and Bell Aerospace. As of late 1984 all three companies had submitted their proposals and two companies will probably be awarded contracts to build prototype vehicles, one of which will eventually be placed in production. All companies have proposed vehicles fitted with a two-man power-operated turret armed with at least a 25-mm cannon plus a co-axial 7.62-mm (0.3-in) machine-gun. The Bell and General Dynamics proposals also have two remote-controlled 7.62-mm (0.3-in) machine-gun installations above the rear troop compartment; these have been fitted as the US Marine Corps expects that in future amphibious operations the US Marines will have to fight further inland than in the past. Although the LVT(X) will have improved mobility, firepower and armour protection over the current LVTP7 series, it will not have a dramatic increase in water speed: unless there is a considerable breakthrough in hull design (apart from the installation of hovercraft type skirts as proposed for the now defunct Landing Vehicle Assault) there is little scope for further development.

The LVT7 family, while smaller than the gargantuan LVT5 series, is much more effective, and considerably less expensive to service and run. It also has greater range on land and in water.



USA

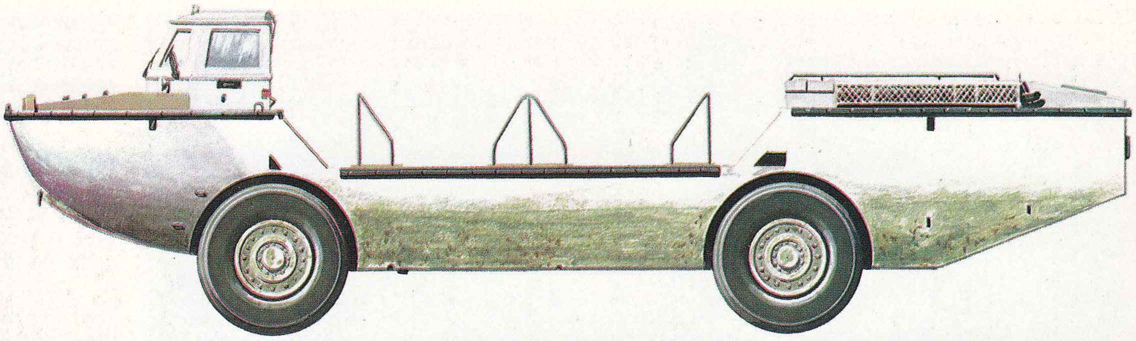
LARC-5 amphibious cargo carrier

In the 1950s the US Transportation Engineering Command issued a requirement for a vehicle capable of transporting 4356 kg (10,000 lb) of cargo from ships lying offshore, across the beach and then to inland dumps. Development of this vehicle, subsequently called the **Lighter Amphibious Resupply Cargo 5-ton (LARC-5)** was carried out by the Borg Warner Corporation. Production was initially undertaken by the Adams Division of Le Tourneau Westinghouse, but final production came from Condiesel Mobile Equipment Division, and between 1962 and 1968 about 950 vehicles were built. In addition to being used by the US Army, the LARC-5 is also known to be in service with Australia, West Germany and Argentina. The last used the vehicle during its invasion of the Falklands in 1982, but by the time of the islands' recapture by the British all of the vehicles had been returned to the mainland.

The hull of the LARC-5 is of all-welded aluminium construction with the cab at the front of the vehicle, cargo areas in the centre and the engine compartment at the very rear. The cab, which is open at the rear, has seats for the driver and two passengers and is provided with a magnetic compass, a heater and windscreen defroster, a portable fire extinguisher, a radio, and a portable lamp and cable. If required, the rear of the cab can be shielded by a fabric cover.

The cargo area is open on the top, but fabric curtains reinforced with stranded wire rope can be installed on each side to protect the cargo from spray. In place of cargo up to 20 fully equipped troops can be carried by the LARC-5, and some vehicles have been fitted to the rear of the cab with a hydraulically-operated boom that can lift a maximum load of 2495 kg (5,500 lb).

The engine compartment is fully enclosed and provided with a fire extinguisher operated from the cargo-deck rear bulkhead. The first production vehicles were powered by a petrol engine but final examples have a diesel engine which reduces the danger of fire.



Above: LARC-5 has been in service since 1962, providing transportation for up to 20 fully equipped troops or 4356 kg (10,000 lb) of cargo.

On roads 4×2 drive is normally used, the 4×4 drive being engaged only when the vehicle is being driven across country; a two-speed transfer case is fitted (high and low ranges). The LARC-5 is powered in the water by a three-blade propeller mounted under the hull at the rear. Both power-operated and manual bilge pumps are fitted for the disposal of any water that seeps into the vehicle. The LARC-5 has no suspension as such, the 18.00×25 tyres absorbing all of the shock. Steering is power-assisted on the front wheels only.

Specification

LARC-5
Crew: 1+2
Combat weight: 14038 kg (30,948 lb)
Powerplant: one Cummins V8 diesel developing 300 hp (224 kW)
Dimensions: length 10.668 m (35 ft 0 in); width 3.149 m (10 ft 4 in); height overall 3.034 m (9 ft 11.4 in)
Performance: maximum road speed 48.2 km/h (30 mph); maximum water speed 16 km/h (10 mph); maximum road range, empty 402 km (250 miles); fording amphibious; gradient 60 per cent; trench not applicable; vertical obstacle about 0.5 m (1 ft 7.7 in)

An LARC-5 of the Australian Army negotiates rough surf, giving a good impression of the conditions that any modern amphibious supply vehicle has to cope with in order to be effective.

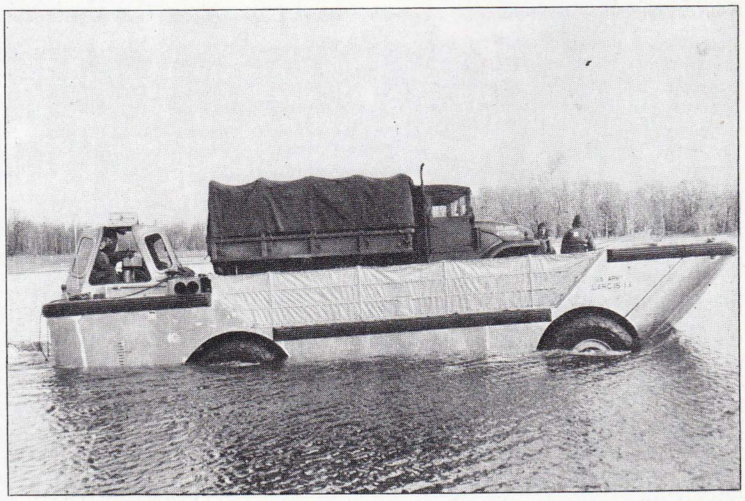
USA

LARC-15 amphibious cargo carrier

The **Lighter Amphibious Resupply Cargo 15-ton (LARC-15)** is a member of a family of 4×4 vehicles designed to meet the requirement of the US Army to transport cargo from ships, over the beach and on to points inland. The other vehicles are the smaller LARC-5 and the much larger LARC-60. The LARC-15 was designed by the Ingersoll-Kalamazoo Division of the Borg Warner Corporation, production being undertaken by the Military Products Division of the Fruehauf Corporation. The first production vehicles were completed in the mid-1960s. The only known operators of the LARC-15 are the USA and West Germany.

The LARC-15 has been designed to carry a maximum load of 15 US tons (13608 kg/30,000 lb) and operate in surf up to 3.048 m (10 ft) high. A major difference between the LARC-5 and the LARC-15 is that the latter has the engine compartment and cab at the rear to make possible the incorporation of a hydraulically-operated bow ramp for the onloading of tracked and wheeled vehicles. Typical loads can include a 155-mm (6.1-in) M114 towed howitzer, whose crew, ammunition and 2½-ton 6×6 towing vehicle are carried in another LARC-15. The sides of the freight area can be fitted with fabric curtains reinforced with stranded wire rope to stop spray reaching the cargo, and with these curtains removed cargo can be loaded and unloaded from the side with the aid of a fork-lift truck.

The engines are mounted under the fully enclosed cab, which can be removed as a complete unit. The engines are coupled to a transmission and a two-speed transfer case (high and low), and in the water the vehicle is propelled by a four-blade propeller mounted under the rear of the hull; waterborne steering is via the wheels and a rudder. The vehicle has no suspension system, the large 24.00×29 tyres absorbing the shock. Steering is power-assisted and the driver can select one of three different modes; two-wheel, four-wheel and oblique



The LARC-15 is the larger brother of the LARC-5, with a capacity of 15 US tons (13608 kg/30,000 lb). Large trucks can thus be carried, but on-land performance is limited when carrying large loads.

(also known as crab), the last being used in very difficult conditions such as those likely to be found on many beaches.

The **LARC-60** was the first of the LARCs to be developed (in the early 1950s) by the Pacific Car and Foundry Company of Renton, Washington. Its normal maximum load of 60000 kg (132,276 lb) can be increased to 100000 kg (220,460 lb) in an emergency, and like other LARCs it was widely used in South Vietnam to transport cargo from ships onto the beach, where it was unloaded into trucks for transportation to supply dumps inland. An unusual feature of the LARC-60 is that it is powered by four engines, one powering each of the four road wheels. When afloat, the vehicle is powered by two propellers at the rear, each of these being driven by two engines. The large 36.00×41 tyres are fitted with a central tyre pressure-regulation system, a feature very useful for crossing deep sand as the pressure can be decreased for improved traction.

Specification

LARC-15

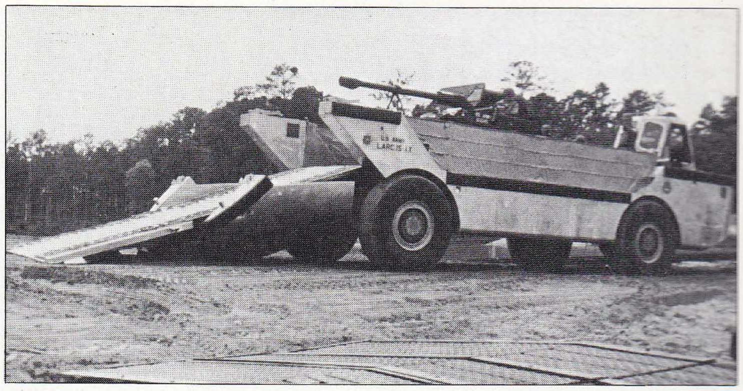
Crew: 1+1

Combat weight: 34100 kg (75,177 lb)

Powerplant: two Cummins V8 diesels each developing 300 hp (224 kW)

Dimensions: length 13.716 m (45 ft 0 in); width 4.419 m (14 ft 6 in); height with cab 4.724 m (15 ft 6 in)

Performance: maximum road speed 50 km/h (31 mph); maximum water speed 15 km/h (9.3 mph); maximum road range, empty 482 km (300 miles); fording amphibious; gradient 40 per cent; trench not applicable; vertical obstacle not known



An early LARC-15 is seen with ramp lowered and an M-56 self-propelled anti-tank gun prepared to unload.

The bulk of the vehicle enables it to operate through up to 3.05 m (10 ft) of surf

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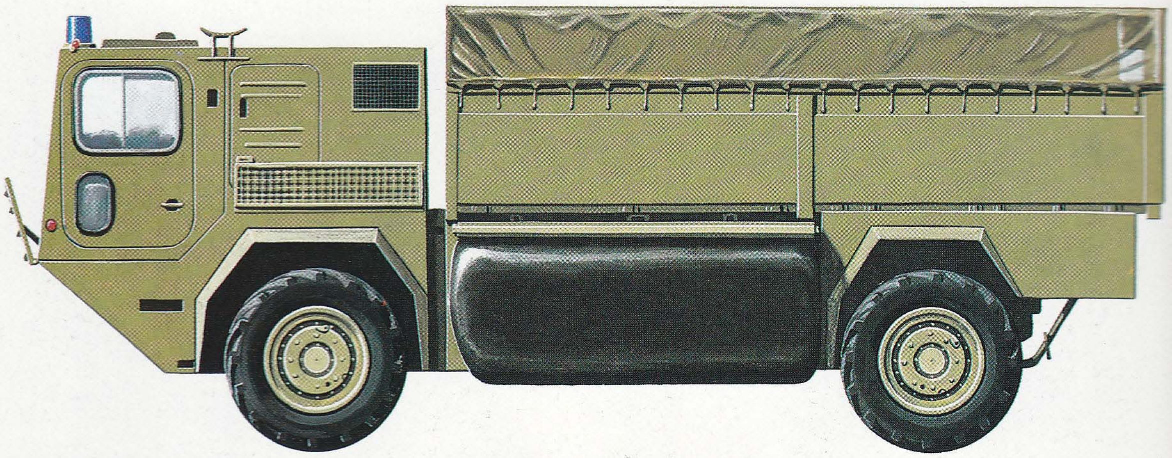
WEST GERMANY

EKW Bison amphibious truck



The EKW Bison was originally designed for civil use in underdeveloped regions, but the obvious military applications of such a vehicle were soon to lead to forces interest.

The **EKW Bison** 4×4 amphibious truck has been developed as a private venture by the Eisenwerke Kaiserlautern Goppner company of West Germany for both civil and military applications, and was seen in public for the first time in 1982. EWK has considerable experience in the development of amphibious vehicles, having already designed the **ALF-2** amphibious fire tender, the **M2** amphibious bridge/ferry systems used by the British, West German and Singapore armies, and more recently the **APE** 4×4 amphibious armoured reconnaissance vehicle. The last was developed to meet the requirements of the West German army but has yet to enter production because of a shortage of funds.

The Bison has a fully enclosed forward control cab with the engine to its rear. The engine is coupled to a fully automatic transmission with six forward and one reverse gear. The load area is at the rear and provided with drop sides, bows and a tarpaulin cover. The normal load is 5000 kg (11,023 lb), but in an emergency a total of 7000 kg (15,432 lb) of cargo can be carried. Before the vehicle enters the water a trim vane is erected at the front, and the flotation bags are extended to each side and inflated with the aid of an APU-driven pump; the flotation bags give additional buoyancy when the Bison is afloat. The APU also provides the power for the two propellers which are mounted at the rear of the hull. These propellers have been designed by Schottel and can be traversed through 360° for increased waterborne manoeuvrability. (Schottel propellers are fitted to many of the armoured fighting vehicles used by the West German army, including the 6×6 Transportpanzer and the 8×8 Luchs reconnaissance vehicle.) Steering is power-assisted to reduce driver fatigue, and dual brakes are fitted as standard (hydraulic on the front wheels and pneumatic on the rear). The Bison is also fitted with a central tyre pressure-regulation system that allows the driver to adjust the tyre pressure to suit the type of terrain being crossed. The Soviets have fitted such a system to most of their wheeled armoured vehicles and many of their cross-country trucks since shortly after the end of World War II.

Another West German designer of amphibious vehicles is Hans Trippel, who has been working on such vehicles for some 50 years and has recently designed the Trippel 4×4 550-kg (1,212-lb) light vehicle which is propelled in the water by two propellers (mounted at the hull rear), each of which can be traversed through 360°. A bilge pump is fitted as standard and this is automatically activated when the vehicle enters the water, so there is no possibility of the driver forgetting to switch it on. This vehicle has yet to enter production for military use.

Specification

Bison

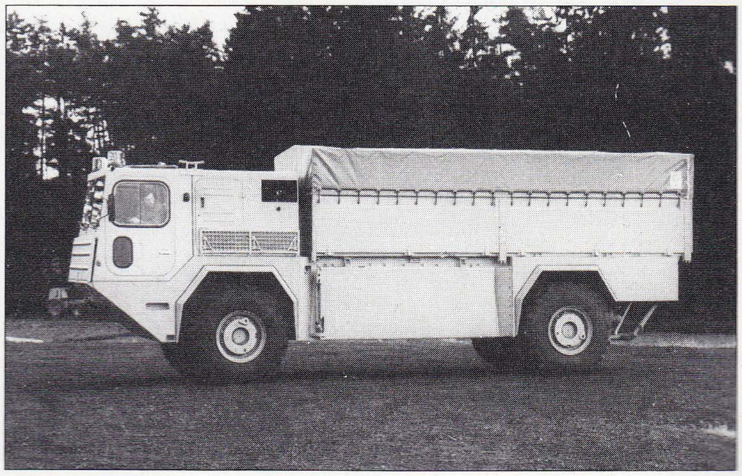
Crew: 1+1

Combat weight: 16000 kg (35,274 lb)

Powerplant: one KHD V8 air-cooled diesel developing 320 hp (239 kW)

Dimensions: length 9.34 m (30 ft 7.7 in); width 2.5 m (8 ft 2.4 in); height to cab roof 2.96 m (9 ft 8.5 in)

Performance: maximum road speed 80 km/h (49.7 mph); maximum water speed 12 km/h (7.4 mph); maximum road range 900 km (559 miles); fording amphibious; gradient 60 per cent; trench not applicable; vertical obstacle not available



The 5000-kg (11,023 lb) capacity Bison is driven by two steerable Schottel propellers at speeds of up to 12 km/h (7.4 mph). As a private venture, the EKW Bison has yet to be ordered for military purposes, but development is complete.

Amphibious Vehicles in Vietnam

The very first regular American troops to set foot in Vietnam were Marines, and the LVTP5 saw extensive use. Nevertheless, there were many other designs which were tried out in the Delta and along the coast.

While helicopters played a major role in the war in Vietnam, the bulk of the fighting was carried out by infantry fighting on foot, although in many operations they were helicoptered to a point as near to their objectives as possible. In the coastal areas a wide variety of craft ranging from destroyers to Bell SK-5 hovercraft (and small junks and motorboats armed with light machine-guns) tried under the codename Operation 'Market Time' to stop the coastal infiltration of men and supplies from North Vietnam .

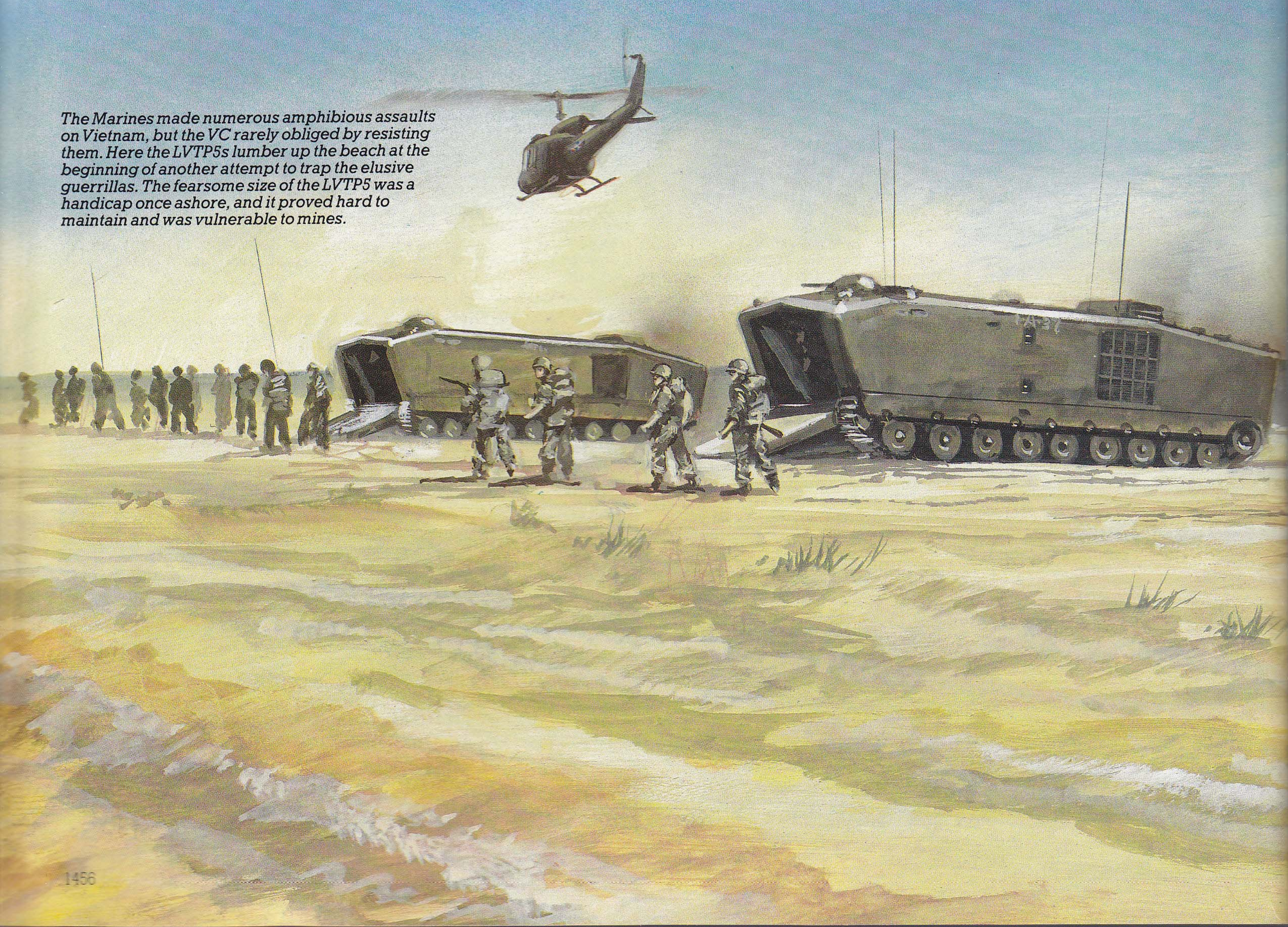
A wide range of craft, many of them armoured and heavily armed, were used to patrol the numerous inland waterways in South Vietnam. The rapid build-up of US forces in Vietnam meant that the existing ports could not hope to cope with the vast increase in required supplies, these ranging from fuel, food and ammunition to replacement vehicles and equipment. In the early days of the build-up ships would often lie off ports for days until berths became vacant. The 4×4 LARC (Lighter Amphibious Resupply Cargo) was widely used in South Vietnam to carry supplies from ships offshore onto the beach, where the valuable cargoes could be offloaded onto 6×6 trucks and taken further inland before being distributed to the individual units. If there were good roads near the beach the LARC-5s could take the cargo direct to supply dumps, so saving time and manpower in unloading.

It was originally thought that the M113 full-tracked armoured personnel carrier could not be employed in South Vietnam, but trials soon dispelled this belief. The M113 could easily propel itself across most of the area's inland waterways, but the main problem came when the vehicle tried to leave the water, as the banks were often very steep and the tracks of the M113 thus lost traction. This problem was solved by putting a capstan-type drum on each of the front-mounted drive sprockets; these were used in conjunction with two ground anchors and lengths of 30.48-m (100-ft) rope for self-recovery. Explosives were also used on occasion to blast away high banks. To overcome small rivers and streams, or to overcome very high banks, M113s fitted with a scissors-type bridge were also deployed in South Vietnam and used with some success.

Although the M113 could cross paddy fields, great efforts were made in the USA to design vehicles with a much lower ground pressure and therefore improved mobility over swampy and marshy terrain. One of the more interesting of these was the Pneumatic All-Terrain Amphibian (PATA) developed by the Ling-Temco-Vought company. This consisted of a central body which contained the V8 petrol engine, transmission, crew and cargo-carrying area. On each side of this were no less than 34 inflated air cells attached to an endless belt. This vehicle could carry 12 men (including its two-man crew) and had a very low ground pressure. It was not accepted for service.

To meet the requirements of the US Marines the XM759 Marginal Terrain Vehicle (MTV) was developed; this could carry 14 fully equipped troops or 1361 kg (3,000 lb) of cargo plus its two-man crew. Instead of conventional tracks this vehicle had 17 wide tyres attached to the track to give a low ground pressure. Trials with this system showed many shortcomings and the type was not built in quantity.

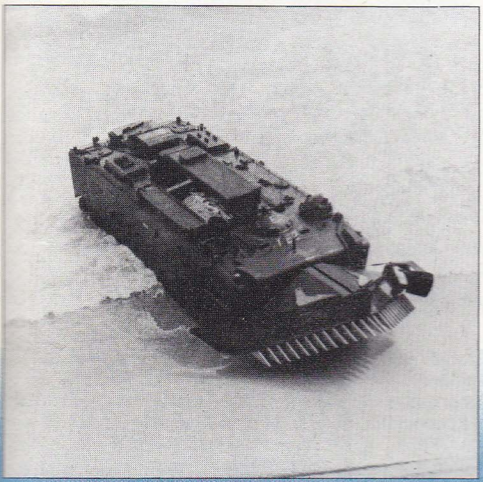
While helicopters were used to transport men and urgent supplies of food and ammunition from one base to another, most of the supplies had to go by road. In the wet season many of the roads in South Vietnam (especially in the central highlands) proved almost impassable to standard 6×6 trucks. In 1966 19 GOER 4×4 amphibious trucks were deployed to South Vietnam, and within 18 months these had carried some 9068 tonnes (8,925 tons) of stores and 6.44 million litres (1.7 million US gal) of fuel with an availability of over 85 per cent. These 19 vehicles were in fact six-year-old prototypes that had been stored in West Germany after trials. Following the successful use in South Vietnam of the GOER, the US Army placed an order in 1971 for 812 cargo trucks, 117 recovery vehicles and 371 tankers, and many of these remain in service today, although they are now

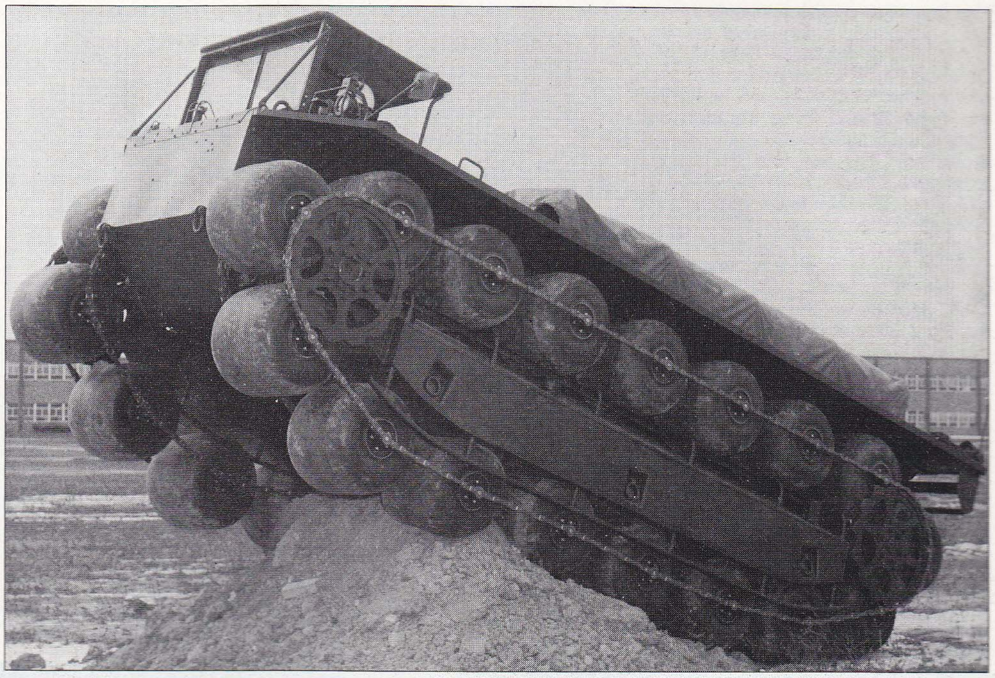


The Marines made numerous amphibious assaults on Vietnam, but the VC rarely obliged by resisting them. Here the LVTP5s lumber up the beach at the beginning of another attempt to trap the elusive guerrillas. The fearsome size of the LVTP5 was a handicap once ashore, and it proved hard to maintain and was vulnerable to mines.

being replaced by the 8×8 Heavy Expanded Mobility Tactical Truck.

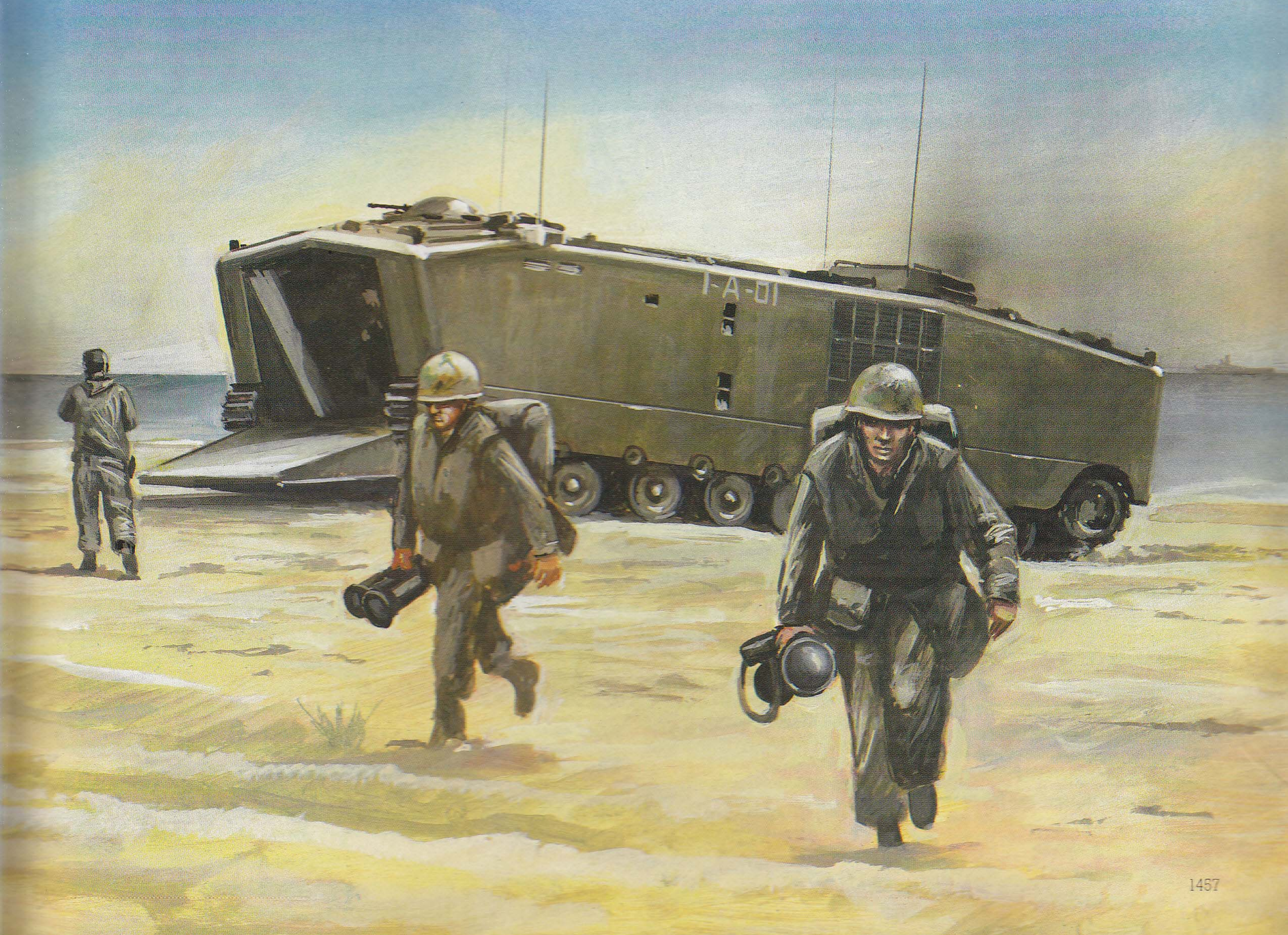
Yet another vehicle developed for use in South Vietnam was the Chrysler Marsh Screw, which was powered by a Chrysler engine which via a transmission drove two large cylindrical screw-type pontoons on each side. This had a maximum speed in marshy terrain of about 22 km/h (14 mph), but caused severe damage to roads. The Soviet LFM-RVD-GPI-66 is very similar to the Marsh Screw, and is based on the GT-T tracked oversnow vehicle.





Left: Emerging from the surf like a mechanical sea monster, this is the LVTE5A1 engineer version of the LVTP5. Dubbed the 'potato digger' by the Marines, it could also fire a 927-kg (2,042-lb) demolition charge to clear minefields.

Above: The XM759 Marginal Terrain Vehicle was designed to cope with the swamps of South East Asia, the wide tyres attached to the track giving the necessary low ground pressure, but it was not a success.

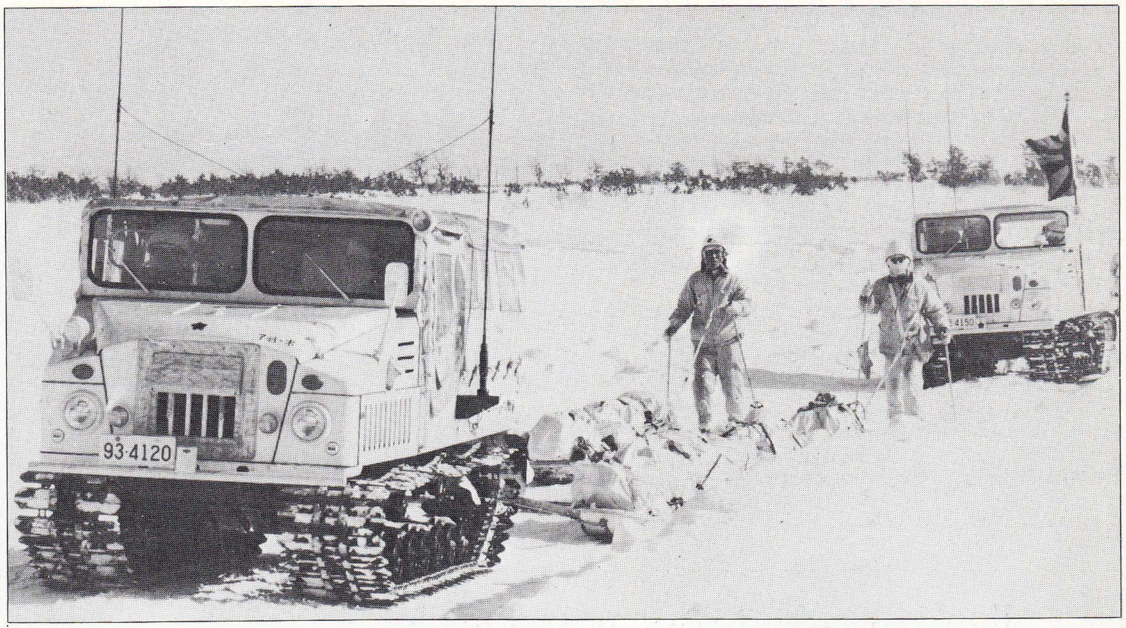


JAPAN

Type 60 oversnow vehicle

The Japanese northern island of Hokkaido is often covered in snow, and this factor led the Japanese Ground Self-Defence Force to the procurement of two full-tracked oversnow vehicles, the **Type 60** and **Type 61**, both designed and built by the Komatsu Manufacturing Company and the Ohara Ironworks. The Type 60, which is also called the **Medium Snow Mobile**, has been designed to carry a total of 10 men (including the driver) or 900 kg (1,984 lb) of cargo, and to tow a trailer or weapon weighing 1500 kg (3,307 lb). The engine is at the front of the Type 60 and coupled to a manual gearbox with four forward and one reverse gear, while the suspension is of the bogie/torsion-bar type with eight dual road wheels, return rollers, drive sprocket and idler. The cargo area is at the rear and provided with a drop tailgate; it is normally covered with removable bows and a tarpaulin cover.

The Type 61 oversnow vehicle, also called the **Large Snow Mobile**, is similar in appearance to the Type 60 but can carry 1280 kg (2,822 lb) of cargo or tow a maximum load of 3200 kg (7,055 lb), and as such is often used to tow ski-fitted artillery such as the 105-mm (4.13-in) M101 which is the standard weapon of its type in the Japanese Ground Self-Defence Force. The Type 61 is powered by an Isuza DA-120T 6-cylinder water-cooled diesel developing 155 hp (116 kW), coupled to a manual gearbox with five forward and one reverse gear.



Evolved from the civilian Komatsu KC-20 designed for use in the northern Japanese island of Hokkaido, the Type 60 was adopted in 1960 by the Japanese Ground Self-Defence Force, largely for use in the same location.

Specification

Type 60

Crew: 1+9

Combat weight: 3770 kg (8,311 lb)

Powerplant: one Toyota 6-cylinder water-cooled petrol engine developing 105 hp (78 kW)

Dimensions: length 4.07 m (13 ft 4.2 in); width 1.98 m (6 ft 6 in); height 2.05 m (6 ft 8.7 in)

Performance: maximum road speed 36 km/h (22 mph); maximum water speed not applicable; maximum range 135 km (84 miles); fording not known; gradient 60 per cent; trench 1.066 m (3 ft 6 in); vertical obstacle 0.5 m (1 ft 7.7 in)

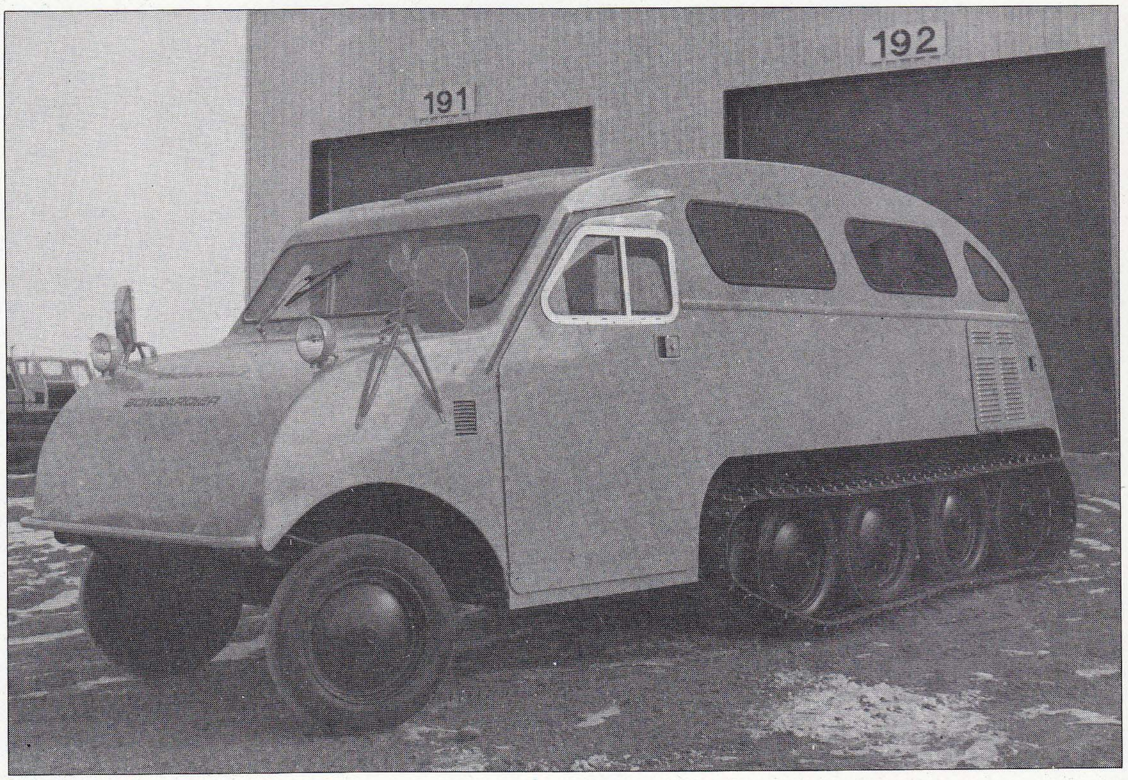
CANADA

Bombardier Snowmobile oversnow vehicle

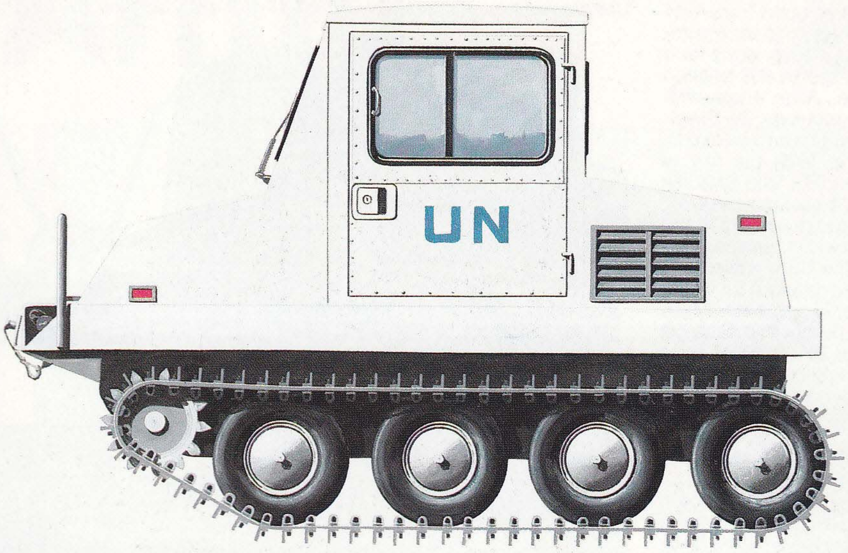
The Industrial Division of Bombardier Limited of Quebec has for many years been involved in the design and production of a variety of tracked and semi-tracked oversnow vehicles for the civilian market. More recently it has undertaken production of some 2,000 M35 CDN 6×6 2½-ton trucks for the Canadian Armed Forces, and is building the West German Iltis 4×4 light vehicle for both the Belgian and Canadian forces. The very small **Bombardier Bombi** oversnow vehicle has been used by the Canadian Armed Forces as part of the United Nations forces operating in the Sinai desert, where the type's very low ground pressure makes it equally at home on sand as on snow. The **Bombardier Ski Doo Elite Snowmobile**, which can carry two passengers, has been tested by the US Marine Corps as a reconnaissance vehicle for possible use in Norway and elsewhere. The full-tracked **Bombardier Skidozer**, which is available with either a petrol or a diesel engine, is used by a number of countries in a military role, although it was not originally designed for this purpose.

The **Bombardier Snowmobile** oversnow vehicle is used by the Canadian Armed Forces in northern Canada as a general utility vehicle, and in appearance is very similar to a coach but the engine is at the rear and coupled to an automatic gearbox with three forward and one reverse gear. The front suspension consists of coil springs and hydraulic shock absorbers and is normally fitted with tyres, though these can be replaced by skis. The rear suspension on each side consists of four rubber-tyred road wheels on trailing arms, fitted with 420 mm (16.5 in) wide tracks which consist of rubber belts with steel crosslinks.

The personnel enter via a large door in the forward part of the vehicle, and there is also a door in the rear and an emergency roof hatch. Steering is of the power-assisted rack and pinion type, and standard equipment includes a heater and defroster, two fuel tanks, wing mirrors, front and rear lights, dry type paper air cleaner, block heater and full instrumentation.



Purchased by the Canadian Armed Forces for use in the wastes of northern Canada, the Bombardier Snowmobile, like many other such vehicles, was originally designed for civil rather than military use.



The Bombardier Bombi has found an unusual use for its abilities with the Canadian contingents of the UN forces in the Middle East, its low ground pressure being as suited to sand as to snow.

Specification

Bombardier Snowmobile
Crew: 1+11
Combat weight: 2337 kg (5,152 lb)
Powerplant: one Chrysler Model 318 V8 petrol engine developing 187 hp (139 kW)
Dimensions: length 5.38 m (17 ft 7.8 in); width 1.95 m (6 ft 4.8 in); height 2.06 m (6 ft 9 in)
Performance: maximum road speed 64 km/h (40 mph); maximum water speed not applicable; maximum range 320 km (199 miles); fording not known; gradient not known; trench not applicable; vertical obstacle not known

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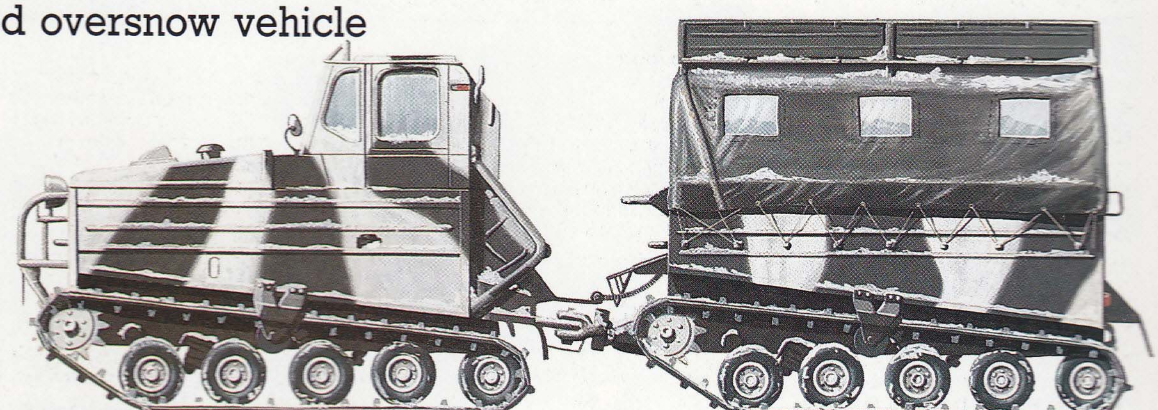
SWEDEN

Bv 202 tracked oversnow vehicle



Naturally, Scandinavia has proved a fertile ground for the design of oversnow vehicles, with the Swedish Bv 202 being in service with several countries, including Turkey and the UK.

The first oversnow vehicle used in any numbers by the Swedish army was the US Weasel, which was developed by Studebaker during World War II and used both in Europe and the Far East. By the mid-1950s these were becoming difficult to maintain and operate, so the Swedish army approached a number of national companies with a proposal to build a new vehicle. As none of them showed any real interest, the Swedish army itself built prototypes which were completed in 1958. These were followed by additional vehicles incorporating improvements as a result of trials with the original test rigs and prototypes. Once the design had been finalized, the complete production programme was put out to tender, and in 1961 Bolinder-Munktell was awarded the first production contract for the vehicle, which was called the **Bv 202**.

The Bv 202 remained in production for almost 20 years, final deliveries being made in 1981. In addition to those for the Swedish army, sales were also made to Finland, the Netherlands, Norway, Turkey and the UK. The last uses its vehicles for a wide range of roles such as command, cargo-carrying and towing the 105-mm (4.13-in) Light Gun on skis. The Royal Marines and Royal Artillery used the vehicle during the 1982 Falklands campaign, where it proved to be one of the few vehicles able to traverse the boggy terrain. In the Swedish army the Bv 202 is now being supplemented by the much improved Bv 206 built by Hägglund & Söner, although it will be many years before the older vehicle is phased out of Swedish service. The Bv 202 is also used for a number of civil roles in Sweden and countries where its low ground pressure enables it to cross with ease terrain such as swamp, mud and snow.

The Bv 202 consists of two units, front and rear, connected by an articulated joint. The front unit contains the engine, transmission, driver and commander, while the rear unit carries the load which can be 800 kg (1,764 lb) across country or 1000 kg (2,205 lb) on roads. The commander and driver are seated in a fully enclosed cab provided with a heater, but the rear unit has only a tarpaulin cover for the troops sitting on a bench seat down each side; if required, however, the rear unit can also be fitted with a heater. The vehicle is fully amphibious, being propelled in the water by its tracks.

When in production the vehicle was offered with a number of options such as a fully enclosed rear unit with stowage rack on top, a torque converter, a cold starting device and a tropical kit. Late-production vehicles had a slightly more powerful engine and a different transmission which gave a slight increase in carrying capacity on roads, and across country.

Specification

Bv 202
Crew: front unit 2 and rear unit 8
Combat weight: 4200 kg (9,259 lb)
Powerplant: one Volvo B18 4-cylinder petrol engine developing 91 bhp (68 kW)
Dimensions: length 6.172 m (20 ft 3 in); width 1.759 m (5 ft 9.3 in); height 2.21 m (7 ft 3 in)
Performance: maximum road speed 39 km/h (24 mph); maximum water speed 3.3 km/h (2 mph); maximum range 400 km (249 miles); fording amphibious; gradient 60 per cent; trench not available; vertical obstacle 0.5 m (1 ft 7.7 in)

A British Army Bv 202 comes ashore from an SRN-6 hovercraft on the coast of Norway. It was used effectively on the peat bogs of the Falkland Islands, where the low ground pressure was a great advantage.

SWEDEN

Bv 206 tracked oversnow vehicle

The **Bv 206** was developed from 1974 by Hägglund & Söner to meet the requirements of the Swedish army for a vehicle to replace the Bv 202 tracked oversnow vehicle. After trials with three batches of prototypes, the Swedish army placed an initial order for production vehicles in 1979, the first of them delivered in 1981. The Swedish army has a requirement for some 4,000 Bv 206s, and export orders have already been placed by Finland, Norway, the UK and the USA, while trials vehicles have been ordered by Canada and Italy. In the US Army the Bv 206 is known as the **Small Unit Support Vehicle M973**, and 268 vehicles have been ordered to replace the old M116 tracked oversnow vehicles which have been in service in Alaska since the 1960s.

Like the Bv 202, the Bv 206 consists of two units, front and rear, connected by a steering unit. The front unit contains the engine and transmission and has seats for five or six men, while the rear unit has seating for 11 men. When used in the cargo-carrying role, the Bv 206 can move a maximum of 600 kg (1,323 lb) in the front unit and 1400 kg (3,086 lb) in the rear unit.

The basic Bv 206 has fully enclosed front and rear bodies of fire-resistant glassfibre reinforced plastic. Each body unit is provided with a heater, which is essential in Sweden during the winter months. The basic vehicle is fully amphibious, being propelled in the water by its tracks. As an option the standard Ford V6 water-cooled petrol engine can be replaced by a Mercedes-Benz 5-cylinder inline turbocharged diesel developing 125 bhp (93 kW).

The anti-tank member of the family is the **Pvbv 2062**, which has an open-topped front body in which is mounted a Bofors 90-mm (3.54-in) recoilless rifle, the rear unit being used for ammunition. The front unit is provided with special roll-over protection bars which can be quickly lowered in action to allow the recoilless rifle to be used. In the future the 90-mm (3.54-in) recoilless rifle will be replaced by the Bofors BILL anti-tank guided missile, while for trials purposes the vehicle has already been fitted with the Hughes TOW anti-tank guided weapon, already used by the Swedish army. The command post version of the Bv 206 is the **Rabv 2061**, and this is fitted with extensive communications equipment. It has also been suggested that the Bv 206 could be fitted with the Swedish Giraffe surveillance radar (on a hydraulically-operated mast) for use in conjunction with the Bofors RBS 70 surface-to-air missile already fielded by the Swedish army.

Specification

Bv 206

Crew: front unit 5 or 6 and rear unit 11

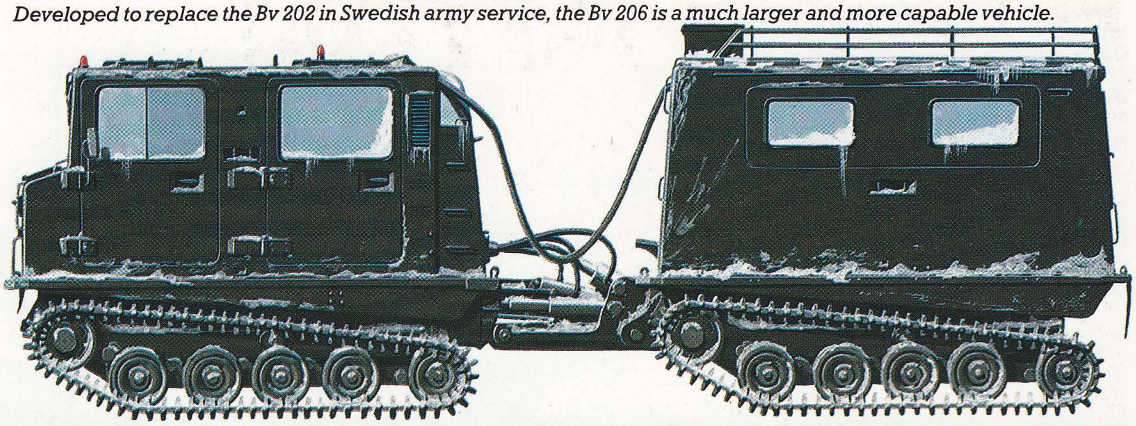
Combat weight: 6340 kg (13,977 lb)

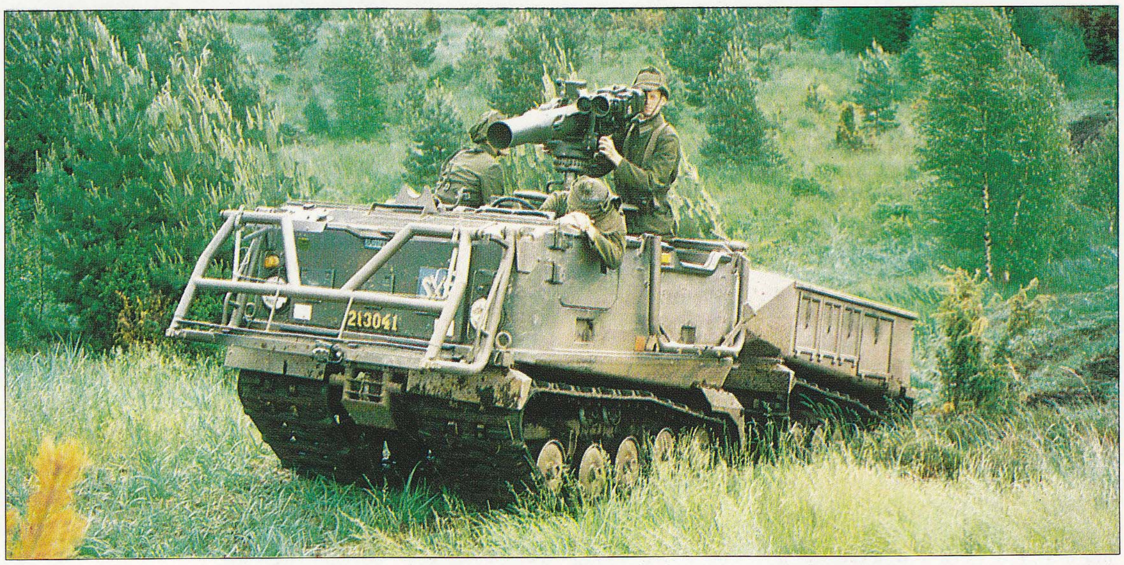
Powerplant: one Ford Model 2658E V6 petrol engine developing 136 bhp (101 kW)

Dimensions: length 6.86 m (22 ft 6 in); width 1.85 m (6 ft 0.8 in); height 2.40 m (7 ft 10.5 in)

Performance: maximum road speed 55 km/h (34 mph); maximum water speed 3 km/h (1.86 mph); maximum range 330 km (205 miles); fording amphibious; gradient 60 per cent; trench not available; vertical obstacle 0.5 m (1 ft 7.7 in)

Developed to replace the Bv 202 in Swedish army service, the Bv 206 is a much larger and more capable vehicle.





Above: The Bv 206 has been fitted with a variety of weapons, including a TOW anti-tank missile mount. It has been ordered by several nations, including the USA, UK, Canada and Italy.

Right: The Bv 206 can transport five or six men in the front section and up to 11 in the rear section. Total cargo capacity is 2000 kg (4,409 lb) in the two sections. Both sections are driven, but the engine and transmission is in the front.

In winter, the Bv 206 enters its element, its fully heated enclosed cabins ensuring crew comfort in the often bitterly cold northern Swedish climate. The Bv 206 is fully amphibious, being propelled in water by its tracks.

British Army

Part 1

Widely respected for its professionalism and efficiency, the British army deploys its main strength in Germany as part of NATO's Northern Army Group. The infantry regiments are equipped with FV432 armoured personnel carriers, seen here behind Ferret armoured cars.

Despite all the many cutbacks and strictures of the past few decades, the British army is still a powerful military organization and it has demonstrated this fact on many occasions, the most recent being the Falkland Islands campaign (Operation 'Corporate') during 1982. That campaign has somewhat hidden the fact that the bulk of the British army's striking power is still maintained as part of NATO and is based in West Germany. There the army operates not as a national army but as part of a much larger European army that trains and acts as a deterrent to any potential aggressor. In this context the units based in the United Kingdom act only as supply and support units for the NATO-assigned forces, only a relatively small force being maintained for home defence. Other forces are still maintained in various parts of the world in what are very much relics of a bygone empire.

The Army in Germany

The army stationed in West Germany is some 52,000 strong and contains nearly all the main combat units of the service. The army in Germany is known collectively as the British Army of the Rhine (BAOR) and is divided into three main components. The main combat element is I (British) Corps, or I (BR) Corps, with its headquarters at Bielefeld. In support of I (BR) Corps is Rhine Area, which is the supply and support element for the corps, and in time of war Rhine Area would become the British Support Corps or BRSC. The third element is the Berlin Infantry Brigade, very much out on a limb and deep within Warsaw Pact territory but maintained there as part of 1945 treaty arrangements.

One of the main things to remember when studying the BAOR is that a good deal of its manpower and equipment strengths are maintained not in West Germany but in the United Kingdom. Nearly every unit in BAOR relies upon reinforcements of men (from the Territorial Army and Regular Reserves) to bring it up to full combat strength, and although there are large stockpiles of supplies and equipment maintained in West Germany at all times, still more would have to be brought over from the United Kingdom in an emergency. In this case the smooth transfer of men and equipment to I (BR) Corps would be the task of the BRSC.

The BAOR operates as part of NATO's Northern Army Group (NORTHAG) with the other NATO-assigned forces of West Germany, Belgium and the Netherlands. In time of peace all the four nations involved maintain their armies under national control and would only operate as a NATO force in an emergency. The only British army units involved with NORTHAG at all times are those of a single Royal Signals regiment.

In an emergency the manpower strength of NORTHAG would expand from about 200,000 to about 500,000. Some of this manpower growth would come from the reinforcements for the BAOR, for although the main striking force of I (BR) Corps consists of four divisions only three of these are actually based in the BAOR area and one of those maintains part of its strength in the United Kingdom.

I (BR) Corps consists of three armoured divisions, one infantry division, an artillery division and corps troops (divided into arms and services). The armoured divisions are the 1st, 3rd and 4th Armoured Divisions, all of which are based in West Germany; the 2nd Infantry Division is based in the United Kingdom, headquartered at York, and it would have to be moved to Germany in an emergency. Each of the divisions, armoured and infantry, has three brigades, and one of the 3rd Armoured Division's brigades (19th Infantry Brigade) is maintained in the United Kingdom at Colchester so it too would have to make its way to Germany if required.

The brigades are either armoured or infantry and the exact make-up of a brigade depends on its operational role in time of war. Of the four divisions two would act as forward units (the 1st and 4th Armoured Divisions) and another would act in support of these two (the 3rd Armoured Division). Each of these divisions would be made up mainly from armoured brigades (each with one or two armoured regiments) and one or two mechanized infantry brigades, with the preponderance of armour forward. The 2nd Infantry Division has three infantry brigades, two of them being Territorial Army brigades.

Having outlined these administrative guidelines, it now has to be said that in time of war all these tidy distinctions would be laid inside a much less defined organization based on the divisions, which would then break up into a number of task forces, battle groups and combat teams. Each armoured division has within its organization three armoured brigades, a reconnaissance regiment, three artillery regiments, an engineer regiment, an Army Air Corps regiment, and transport, medical, stores support, repair and provost units. All these units are divided up and assigned into battle groups, although some units (medical, supply and comparable units) would stay under division control. The main problem is that each battle group is formed to meet a particular operational requirement or objective and thus no two are the same. In theory each battle group is formed from a balanced grouping of armour, infantry and artillery with engineer and signal support, but in some instances local preponderances of one arm or another are bound to occur. For example, in a forward area much of the battle group will be made up from armour while in a rear area there might well be more infantry. In some areas battle groups or combat teams (two or three of which form a battle group) may well be mainly made up from anti-tank defence weapons, but it must be stressed that this is dependent purely upon local conditions and the manner in which the local commander sees fit to conduct his task.

The main I (BR) Corps operational area can be defined as a strip of land extending from a line drawn east of Hannover down to the Harz mountains in the

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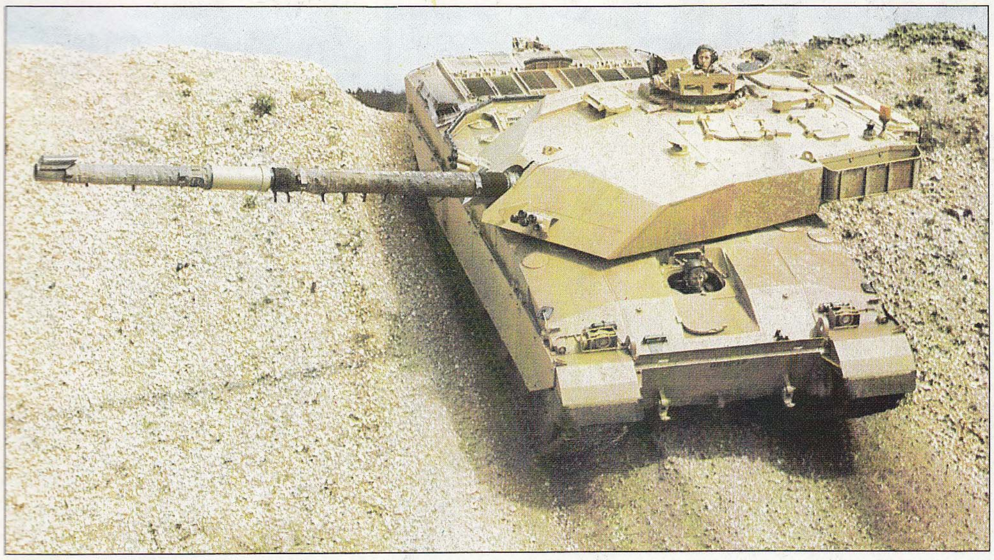

Protected by Chobham armour and mounting the trusty L11A5 120-mm rifled gun, the FV4030/4 Challenger is one of the most powerful main battle tanks in the world, but at the time of writing only one armoured division is scheduled to receive them.

south, and extending eastwards to the Inner German Border (IGB) between East and West Germany. To the rear of I (BR) Corps and back to the Channel is the domain of Rhine Area/BRSC, and the 2nd Infantry Division would be used to maintain and guard the supply lines to I (BR) Corps through this area.

Not all of I (BR) Corps troops would be assigned to the divisions. Under direct corps control is the artillery division, which has a long-range general support regiment (armed with 175-mm/6.89-in M107s), a missile regiment (armed with the nuclear Lance missile), a heavy regiment (armed with 203-mm/8-in M110 howitzers, also with a nuclear capability), two Rapier-armed light air defence regiments (with a mix of Tracked and Towed Rapiers), and a locating regiment. Corps troops include an amphibious engineer regiment (equipped with the M2 floating bridge and ferry), an armoured engineer regiment (equipped with Centurion AVREs and Chieftain AVLBs), two corps signal regiments and a special corps Army Air Corps squadron. To these must be added a whole retinue of various service units.

In Berlin the Berlin Infantry Brigade is made up of three infantry battalions and a single armoured squadron. In an emergency it would have a holding role only and would not expect to be reinforced.

The United Kingdom

For the army the United Kingdom acts as its main recruiting area, its training centre and as its main supply and support centre. Only a relatively small number of units are assigned to home defence as the national executive has decided that the best place to defend the nation is on the European continent, and thus in an emergency nearly all units and manpower would decamp for Germany. To maintain this situation the United Kingdom is divided into a number of districts, each with its administrative tasks of seeing to the day-to-day functions of all the establishments and units within its area, be they Regular Army or Territorial Army.

Within the United Kingdom three brigades are maintained at all times as part of the 2nd Infantry Division for BAOR (these are the 24th Infantry Brigade, the 15th Infantry Brigade (V) and the 49th Infantry Brigade (V), both the latter being TA brigades. To these must be added three more brigades; the first of these is the 19th Infantry Brigade, which is assigned to the 3rd Armoured Division in BAOR. The second is the 1st Infantry Brigade, which has two functions: the NATO central reserve and the basis for the United Kingdom component of the NATO Allied Mobile Force (Land) or AMF(L), which is a multi-national force intended for use on either of the NATO flanks in Norway or Turkey. The third UK-based brigade is the 5th Infantry Brigade, which is designed for the home defence of the United Kingdom but which took part in the Falkland Islands campaign of 1982. Other brigades are administrative only and are maintained by the various district headquarters. One of the district headquarters, the North East District at York also doubles as the headquarters for the BAOR's 2nd Infantry division, though a forward headquarters for this division is maintained at Lubbecke.

The United Kingdom acts as the main training base for the army. Nearly all the army's basic, trade, officer and other training is carried out in the United Kingdom, and the personnel from the various training establishments would make up much of the home defence personnel in an emergency. Most of the army's main supply, repair, research and development facilities are also based in the United Kingdom. The main administrative and policy sections are based in London and its environs while large training areas are centred around Salisbury Plain, the Aldershot area, Catterick in the north and several other areas well known to generations of soldiers.

The Army abroad

The British army still maintains sizable numbers of soldiers at various locations overseas, the main strength currently being in the Falklands. The army's main manpower contribution to the Falklands is now past, but about three infantry battalions plus artillery, engineer, reconnaissance, Army Air Corps and other elements are still maintained there. Once the new airport at Mount Pleasant is complete it is expected that these levels will fall to a much lower total.

Northern Ireland is hardly overseas but it is still a constant drain on the army's manpower resources, even though the local police forces have now assumed many responsibilities once maintained by the army. There the army has established the Ulster Defence Regiment (some 7,100 strong and organized into 11 battalions to undertake many of the army's routine duties) but a number of infantry and other battalions (variable according to the local state of tensions) are on duty there at any one time.

An infantry battalion is maintained in Gibraltar, and in Belize in Central America a mixed force of infantry, artillery, Army Air Corps, engineer and other troops is based to maintain the sovereignty of what was British Honduras. In Cyprus two weak infantry battalions plus the usual support forces are used to guard the British Sovereign bases; these also act as part of the United Nations Force in Cyprus (UNFICYP). A small force also works with the United Nations in Sinai. Away to the east in Hong Kong the army has a single infantry battalion plus four Gurkha battalions with another Gurkha battalion in Brunei. The Gurkhas are very much part of the British army still, and have a battalion based in the United Kingdom; they also have their own engineers, signals and transport squadrons, and one of the Gurkha engineer units is based in the United Kingdom at regimental strength.

The army also maintains large training areas in Kenya and Canada. The Canadian area at Suffield in Alberta is large enough for almost unlimited live firing exercises to be held. This facility is used for the training of battle groups from BAOR.

In service since 1967, the Chieftain will continue to provide the bulk of British tank strength for many years to come. Heavily armoured and also equipped with the L11A5 120-mm gun, Chieftains are currently being retrofitted with the Improved Fire Control System.